

Contents

Q: Enumerate all the diseases against which vaccines are currently available	4
Q: Classify Vaccines	5
Q: Immunization Schedule for Children with AIDS	6
Q: Immunization in immunosuppressed children	8
Q: Immunization in adolescents	11
Q: Live Vaccines Used in Pediatric Age Group	14
Q: Adverse Reactions Following Vaccines in the National Immunization Schedule in India	17
Q: Describe briefly various adverse reactions following vaccinations and discuss their management	18
Q: Combination vaccine	19
Q: Write the differences in efficacy, duration of protection and adverse effects between whole cell and acellular pertussis vaccine.	24
Q: Vaccine Vial Monitor (VVM)	25
Q: Tabulate the various newer vaccines available to prevent respiratory disease in children, with their types, dosage schedule, route, important side effects and efficacy.	26
Q: Salient Differences Between Govt. of India National Immunization Schedule and IAP (Indian Academy of Pediatrics) Immunization Schedule	27
Q: Describe the criteria or conditions to be considered for approving a 'newer' vaccine in an immunization program of a developing country	29
Q: Define and describe the following: a. Herd immunity b. Herd effect c. Vaccine immunogenicity d. Vaccine efficacy; and e. Vaccine effectiveness f. Vaccine potency g. AEFI	31
Q: Cold Chain	33
Q: Components of cold chain for immunisation in a hospital setting and its monitoring ...	35
Q: Conjugate vaccine	36
Q: Pentavalent Vaccines	38

Q: Adolescent vaccination	39
Q: Adverse Events Following Immunization (AEFI)	41
Q: Casualty assessment in AEFI	43
Q: Classification of Adverse Events Following Immunization (AEFI)	45
Q: Different immunisation campaigns in India and their role in improving immunization coverage	47
Q: Future vaccines	48
Q: Write briefly about different types of vaccine against rabies	49
Q: Discuss various schedules of pre and post-exposure prophylaxis for rabies in detail; Post exposure prophylaxis for dog bite	51
Q: Anti-rabies vaccine – Different schedules, advantages of each schedule; Post exposure prophylaxis for dog bite	52
Q: Varicella Vaccine	53
Q: Complications of Measles Vaccination and Management	54
Q: Haemophilus Influenzae Type B (Hib) Vaccine	55
Q: Tabulate the following details with regards to Rotavirus vaccine, Hep A,B, Varicella, HIB vaccine and pneumococcal vaccine: a) Type of vaccine b) Dose c) Route d) Appropriate age of vaccination e) Justification of its usage f) Side effect and g) Drawback	58
Q: Typhoid Vaccines	59
Q: Typhoid Conjugate Vaccine (TCV)	59
Q: Hepatitis B Immunization	61
Q: Pneumococcal Vaccine	62
Q: Influenza Type B Vaccine	64
Q: Post-DPT Vaccine Encephalopathy	66
Q: Discuss the current role, advantages and disadvantages of OPV and IPV in control and eradication of poliomyelitis in India	67
Q: Status of Polio vaccines	68

Q: What is inactivated polio vaccine (IPV). What are the advantages and disadvantages of IPV over OPV? What is the schedule of IPV as recommended by IAP.	69
Q: Vaccine-Associated Paralytic Poliomyelitis (VAPP)	70
Q: HPV Vaccine; current status	72
Q: Utility and Controversy of HPV Vaccine	73
Q: Rotavirus Vaccine	74
Q: BCG Vaccine	76
Q: BCG Lymphadenitis	77
Q: COVID-19 Vaccines	78
Q: Japanese Encephalitis (JE) Vaccines	80
Q: Vaccination in a child with cancer chemotherapy	82
Q: AEFI types	84
Q: Vaccine hesitancy	87
Q: MR vaccine	89

---X-----X---

Q: Enumerate all the diseases against which vaccines are currently available

Viral Diseases	Bacterial Diseases	Parasitic Diseases
1. Measles 2. Mumps 3. Rubella 4. Hepatitis A 5. Hepatitis B 6. Influenza 7. Varicella (Chickenpox) 8. Human Papillomavirus (HPV) 9. Polio 10. Rotavirus 11. Yellow Fever 12. Rabies 13. Japanese Encephalitis 14. Dengue 15. Smallpox (Vaccine not publicly available but stockpiled) 16. Zoster (Shingles) 17. Tick-Borne Encephalitis 18. Respiratory Syncytial Virus (RSV) Under development 19. COVID-19	1. Diphtheria 2. Tetanus 3. Pertussis (Whooping Cough) 4. Haemophilus influenzae type b (Hib) 5. Pneumococcal Disease (Streptococcus pneumoniae) 6. Meningococcal Disease (Neisseria meningitidis) 7. Tuberculosis (BCG vaccine) 8. Typhoid 9. Cholera 10. Plague 11. Anthrax 12. Lyme Disease (Vaccine not currently available but was previously) 13. Leptospirosis Available in some countries	1. Malaria Under development, limited use 2. Guinea Worm Disease (Dracunculiasis) Vaccine under development

Fungal Diseases

- Currently, there are no vaccines for fungal diseases, but research is ongoing

Combination Vaccines

- MMR (Measles, Mumps, Rubella)
- DTP (Diphtheria, Tetanus, Pertussis)
- DTaP-Hib
- DTaP-HepB-IPV (Diphtheria, Tetanus, Pertussis, Hepatitis B, Polio)
- Tdap (Tetanus, Diphtheria, Pertussis for older children and adults)

Hexavalent vaccines (DTP, Hep B, Polio, Hib)

-----X-----X-----

Q: Classify Vaccines

Live-Attenuated Vaccines	Inactivated or "Killed" Vaccines	Subunit, Recombinant, Polysaccharide, and Conjugate Vaccines	Toxoid Vaccines
Measles Mumps Rubella Varicella (Chickenpox) Yellow Fever Rotavirus Oral Polio Vaccine (OPV) BCG (Tuberculosis) Influenza (Nasal Spray)	Polio (IPV) Hepatitis A Rabies Influenza (Injectable) Japanese Encephalitis	Haemophilus influenzae type b (Hib) Hepatitis B Human Papillomavirus (HPV) Pertussis (part of DTaP) Pneumococcal (PCV13, PPSV23) Meningococcal (MenACWY, MenB)	Tetanus Diphtheria

		Typhoid (Vi polysaccharide, conjugate) Shingles (Zoster)	
--	--	---	--

mRNA Vaccines

- COVID-19 (Pfizer-BioNTech, Moderna)

Viral Vector Vaccines

- COVID-19 (AstraZeneca, Johnson & Johnson)
- Dengue (CYD-TDV, Dengvaxia)

Experimental or Limited Use

- Malaria (RTS,S/AS01, Mosquirix)

Ebola (rVSV-ZEBOV-GP, Ervebo)

---X-----X---

Q: Immunization Schedule for Children with AIDS

General Principles

- **Live Vaccines:** Generally contraindicated due to impaired immune response and risk of disseminated infection.
- **Inactivated Vaccines:** Generally safe but may require adjusted dosing or timing for optimal efficacy.

Routine Immunizations

- **DTaP (Diphtheria, Tetanus, Pertussis):** Standard schedule but monitor for adequate seroconversion.
- **Hepatitis B:** Standard schedule; may require additional doses for adequate seroconversion.
- **Hib (Haemophilus influenzae type b):** Standard schedule; consider booster doses.
- **Pneumococcal Vaccine (PCV13, PPSV23):** Standard primary series with PCV13; one dose of PPSV23 after age 2.
- **Inactivated Polio Vaccine (IPV):** Standard schedule.

Additional Immunizations

- **Hepatitis A:** Two doses, six months apart, starting at age 1.
- **Meningococcal Vaccine:** Both MenACWY and MenB vaccines as per guidelines for immunocompromised patients.

Generally Contraindicated Vaccines

- **MMR (Measles, Mumps, Rubella):** Contraindicated.
- **Varicella:** Contraindicated.
- **Rotavirus:** Contraindicated.

Optional/Special Circumstances

- **Influenza:** Inactivated influenza vaccine annually; avoid live attenuated influenza vaccine.
- **HPV (Human Papillomavirus):** May be considered in adolescents

Monitoring and Boosters

- **Serologic Testing:** To assess vaccine efficacy and need for boosters.
- **CD4 Count:** Regular monitoring to assess immune status.

Precautions

- **Close Contacts:** Ensure that close contacts are fully vaccinated to provide herd immunity.
- **Adverse Reactions:** Monitor for vaccine-specific adverse reactions more diligently
- The Indian Academy of Pediatrics (IAP) provides guidelines for the immunization of children infected with the Human Immunodeficiency Virus (HIV), which causes AIDS. The recommendations differ based on whether the child is asymptomatic or symptomatic.
 - **Asymptomatic HIV-infected Children:**
 - BCG vaccine is recommended at birth.
 - DTwP/DTaP/Td/Tdap vaccines are to be administered as per the routine schedule at 6, 10, 14 weeks, 18 months, and 5 years.
 - IPV (Inactivated Poliovirus Vaccine) is advised at 6, 10, 14 weeks, 12–18 months, and 5 years.

- Varicella vaccine is recommended in two doses at 4–12 weeks interval.
- HPV vaccine is advised for females only, as per the routine schedule of 3 doses at 0, 1–2, and 6 months starting at 10 years of age.
- **Symptomatic HIV-infected Children:**
 - BCG vaccine is not recommended.
 - Live vaccines are generally forbidden, but measles/MMR/varicella vaccines may be considered on individual merit.
 - Varicella vaccine is recommended if the CD4 count is above certain levels.
- Vaccination is generally safe and effective early in infancy before HIV infection causes severe immune suppression. However, the duration of protection may be compromised due to impairment of memory response with immune attrition.
- In older HIV-1 infected children and adults, the immune response to primary immunization may be less, but protective immunity to vaccines received prior to the infection is usually maintained. However, immunity to measles, tetanus, and hepatitis B wanes faster than other antigens.
- Monitoring of seroconversion post-vaccination is desirable in an HIV-infected child. There is a multifold enhanced risk of diseases like tuberculosis, hepatitis (A and B), measles, influenza, varicella, pneumococcal, and meningococcal disease in such children.

The guidelines align with recommendations from the World Health Organization (WHO), American Academy of Pediatrics (AAP), Advisory Committee on Immunization Practices (ACIP), and Centers for Disease Control and Prevention (CDC).

---X-----X---

Q: Immunization in immunosuppressed children

Immunization in Immunosuppressed Children

Importance

- **Vulnerable Population:** Immunosuppressed children are at higher risk for severe complications from vaccine-preventable diseases.
- **Limited Immune Response:** These children may not mount a robust immune response, making vaccination strategies complex.

- **Special Considerations:** Timing, type, and dosage of vaccines may differ from the general population.

Types of Immunization

1. **Inactivated Vaccines**

- **Examples:** IPV, Hepatitis B, Pneumococcal
- **Dosage:** Standard or increased
- **Route:** Intramuscular
- **Side Effects:** Local pain, mild fever
- **Efficacy:** Variable, often lower
- **Recommendation:** Generally safe and often recommended

2. **Live-Attenuated Vaccines**

- **Examples:** MMR, Varicella, Rotavirus
- **Dosage:** Standard
- **Route:** Subcutaneous/Oral
- **Side Effects:** Risk of disease manifestation
- **Efficacy:** Variable, often lower
- **Recommendation:** Usually contraindicated

Special Considerations

- **Timing:** Vaccination should ideally be done before immunosuppressive therapy when possible.
- **Household Contacts:** Should be up-to-date with vaccinations to reduce risk of transmission.
- **Serologic Testing:** May be done to assess immunity levels post-vaccination.
- **Consultation:** Immunization should be coordinated with specialists like immunologists and oncologists.

Challenges

- **Efficacy:** Reduced efficacy due to compromised immune system.
- **Safety:** Risk of adverse reactions or disease manifestation, especially with live vaccines.



- **Monitoring:** Requires close monitoring for side effects and efficacy.

Management

- **Close Monitoring:** Regular follow-ups to assess vaccine efficacy and side effects.
- **Booster Doses:** May be required to achieve adequate immunity.
- **Alternative Therapies:** Passive immunization may be considered in some cases.

Immunization Policies Following Special Treatments

Immunization Post Intravenous Immunoglobulin (IVIG) Treatment

- **Live Vaccines:**
 - **Delay:** Typically delayed for 3-11 months post-IVIG.
 - **Rationale:** IVIG can neutralize the vaccine virus.
- **Inactivated Vaccines:**
 - **Timing:** Can generally be given as scheduled.
 - **Monitoring:** Serological testing may be required to confirm efficacy.

Immunization Post Corticosteroid Treatment

- **High-Dose, Long-Term Therapy:**
 - **Live Vaccines:** Contraindicated during and for at least 1 month after treatment.
 - **Inactivated Vaccines:** Can be administered but may require booster doses.
- **Low-Dose, Short-Term Therapy:**
 - **Live Vaccines:** Generally acceptable.
 - **Inactivated Vaccines:** No special precautions.

Immunization Post Chemotherapy

- **Live Vaccines:**
 - **Delay:** At least 3 months post-chemotherapy.
 - **Rationale:** Risk of vaccine-derived disease.
- **Inactivated Vaccines:**



- **Timing:** Can be given but efficacy may be compromised.
- **Booster:** Additional doses may be required.

General Considerations

- **Individualized Plan:** Consultation with healthcare providers for a tailored immunization schedule.
- **Serological Testing:** To assess the efficacy of vaccines post-treatment.
- **Household Contacts:** Should be up-to-date with vaccinations to reduce risk of transmission.

Challenges and Management

- **Efficacy:** Reduced efficacy due to compromised immune system.
- **Safety:** Risk of adverse reactions or disease manifestation.

Monitoring: Requires close monitoring for side effects and efficacy.

---X-----X---

Q: Immunization in adolescents

Key vaccines recommended for adolescents:

1. **Tetanus, Diphtheria, and Pertussis (Tdap):**

- **Age:** Recommended at 11-12 years.
- **Dose:** Single dose.
- **Purpose:** Booster to protect against tetanus, diphtheria, and pertussis.

2. **Human Papillomavirus (HPV) Vaccine:**

- **Age:** Recommended starting at 11-12 years; can be given starting at age 9.
- **Dose:**
 - Two doses for those who start the series before their 15th birthday, given 6-12 months apart.
 - Three doses for those who start on or after their 15th birthday, with the second dose 1-2 months after the first, and the third dose 6 months after the first.
- **Purpose:** Protects against HPV-related cancers and genital warts.

3. **Meningococcal Conjugate Vaccine (MenACWY):**

- **Age:** First dose at 11-12 years, with a booster at 16 years.
- **Dose:** Two doses.
- **Purpose:** Protects against meningococcal disease caused by serogroups A, C, W, and Y.

4. **Meningococcal B Vaccine (MenB):**

- **Age:** May be given to teens aged 16-18 years, based on individual decision-making.
- **Dose:**
 - Two or three doses depending on the brand (Bexsero: 2 doses, Trumenba: 3 doses).
- **Purpose:** Protects against meningococcal disease caused by serogroup B.

5. **Influenza Vaccine:**

- **Age:** Annually for all adolescents.
- **Dose:** One dose each year.
- **Purpose:** Protects against seasonal influenza.

6. **Measles, Mumps, and Rubella (MMR):**

- **Age:** If not given in childhood, should be administered in adolescence.
- **Dose:** Two doses.
- **Purpose:** Protects against measles, mumps, and rubella.

7. **Varicella Vaccine:**

- **Age:** If not given in childhood, recommended for adolescents without evidence of immunity.
- **Dose:** Two doses.
- **Purpose:** Protects against chickenpox.

8. **Hepatitis A Vaccine:**

- **Age:** For adolescents not vaccinated as children.
- **Dose:** Two doses, 6 months apart.
- **Purpose:** Protects against hepatitis A.

9. *Hepatitis B Vaccine:*

- **Age:** For adolescents not vaccinated as children.
- **Dose:** Three doses over 6 months.
- **Purpose:** Protects against hepatitis B.

Additional Considerations:

- **Catch-Up Vaccinations:** Adolescents who missed earlier vaccines should receive catch-up vaccinations.
- **Consent and Education:** It's important to educate adolescents and their guardians about the benefits and potential side effects of vaccines.
- **Special Circumstances:** Additional vaccines may be recommended for adolescents with certain health conditions like pregnancy, lifestyles, or travel plans.

Vaccination for consideration in adolescent pregnancies

1. *Influenza Vaccine:*

- **Timing:** Any trimester.
- **Type:** Inactivated influenza vaccine (IIV) or recombinant influenza vaccine (RIV).
- **Purpose:** Protects against seasonal influenza, which can be more severe in pregnant women.

2. *Tetanus, Diphtheria, and Pertussis (Tdap) Vaccine or TT :*

- **Timing:** Ideally between 27 and 36 weeks of gestation, in every pregnancy.
- **Type:** Tdap or TT in public sector.
- **Purpose:** Protects against tetanus, diphtheria, and pertussis. Pertussis vaccination in pregnancy helps protect the newborn through passive transfer of antibodies.

3. *COVID-19 Vaccine:*

- **Timing:** Any trimester, including during preconception period.
- **Type:** mRNA vaccines (e.g., Pfizer-BioNTech, Moderna) are commonly recommended.

- **Purpose:** Protects against COVID-19, which can have more severe effects in pregnant women.

Vaccines to Avoid During Pregnancy:

- **Live Vaccines:** Such as MMR (measles, mumps, rubella), varicella (chickenpox), and live attenuated influenza vaccine (LAIV).
- **Other Live Vaccines:** Such as the nasal spray flu vaccine and the yellow fever vaccine, should be avoided unless the benefits outweigh the risks (e.g., in the case of travel to areas with high yellow fever risk).

Additional Considerations:

- **Hepatitis B Vaccine:** If a pregnant woman is at high risk for hepatitis B infection (e.g., healthcare worker, sexually active with multiple partners), vaccination is recommended.
- **Pneumococcal Vaccine:** Recommended for pregnant women with certain chronic conditions that increase the risk of pneumococcal disease.
- **Pre-Pregnancy Vaccination:** Women planning a pregnancy should ensure they are up to date with recommended vaccines, particularly MMR and varicella, to avoid infections that can be harmful during pregnancy.

Counseling and Consent:

- **Risk-Benefit Analysis:** Healthcare providers should discuss the benefits and potential risks of vaccines with pregnant women.
- **Informed Consent:** Pregnant women should provide informed consent after understanding the importance of vaccination for their health and their baby's health.

-----X-----X-----

Q: Live Vaccines Used in Pediatric Age Group

Viral Vaccines

- **Measles, Mumps, Rubella (MMR):** Administered at 9 months, 12-15 months and 4-6 years.
- **Varicella (Chickenpox):** Administered at 12-15 months and 4-6 years.
- **Rotavirus:** Administered at 6, 10 and 14 weeks.
- **Yellow Fever:** Administered at 9 months or older for those traveling to endemic areas.



- **Oral Polio Vaccine (OPV):** Used in some countries but replaced by IPV in many due to risk of vaccine-derived poliovirus.

Bacterial Vaccines

- **BCG (Bacillus Calmette-Guérin):** Administered at birth in TB-endemic countries.
- **Ty21a (Salmonella Typhi):** Oral typhoid vaccine, administered from age 6 and up in endemic areas or for travellers.

Combination Vaccines

- **MMRV (Measles, Mumps, Rubella, Varicella):** Administered at 12-15 months and 4-6 years.
- **ProQuad (MMR + Varicella):** An alternative to separate MMR and Varicella vaccines.

Special Circumstances

- **Intranasal Influenza Vaccine:** Live attenuated influenza vaccine (LAIV) for ages 2-49; not recommended for immunocompromised.

Contraindications

- **Immunocompromised Status:** Generally contraindicated except under specialist guidance.
- **Pregnancy:** Contraindicated for female adolescents who are pregnant.
- **Live Attenuated Influenza Vaccines:** These vaccines provide broader and higher levels of protection than trivalent inactivated vaccines in healthy children aged 2–5 years. They are not recommended below 2 years of age, in high-risk individuals, and in pregnant women. The vaccine contains two influenza A strains and two influenza B strains. The overall efficacy against laboratory-confirmed influenza is 82%, and effectiveness against ILI is 33%
- **Tuberculosis Vaccine (BCG):** Live attenuated Mycobacteria, including modified versions of Bacillus Calmette-Guerin (BCG), are used as primary vaccines against tuberculosis. These are usually given to most infants in developing countries at birth
- **Measles, Mumps, and Rubella (MMR) and Varicella Vaccines:** These live vaccines may be considered for use in HIV-infected children based on individual merit. Yellow fever vaccine is contraindicated in symptomatic HIV-infected children but can be given in asymptomatic ones

- **Corticosteroids/Other Immunosuppressive Therapy:** Children receiving high doses of oral corticosteroids should not receive live virus vaccines until the steroids have been discontinued for at least 1 month
- **Meningococcal Vaccines:** These are recommended only for certain high-risk conditions and situations in children aged 2 years or more. Conjugate vaccines are preferred over polysaccharide vaccines due to their increased immunogenicity, particularly in children < 2 years of age
- **Significance of Adolescent Immunization:** Vaccines are offered to adolescents to protect them against diseases that have higher morbidity or incidence during the adolescent period. Important adolescent vaccines related to pertussis, human papillomavirus (HPV), and meningococcal vaccines are available

The document provides a comprehensive overview of various vaccines, including live attenuated ones, and their applicability in different age groups and health conditions. It is crucial to note that the use of live vaccines often depends on the individual's health status, including any underlying conditions or treatments they may be receiving.

- **Live Vaccines**

Vaccine Name	Description and Usage
BCG (Bacillus Calmette-Guerin)	Used as a primary vaccine against tuberculosis. Given to most infants in developing countries at birth.
Oral Polio	Given simultaneously or at any interval before or after any inactivated or live vaccine.
Measles	May be given in HIV-infected children based on individual merit.
MMR (Measles, Mumps, Rubella)	May be given in HIV-infected children based on individual merit.
Chickenpox (Varicella)	May be given in HIV-infected children based on individual merit.
Live Attenuated Influenza	Provides broader and higher levels of protection in healthy children aged 2–5 years.
Oral Typhoid	Contraindicated in patients with severe B cell immunodeficiency.

- **Additional Notes:**
 - Live vaccines induce an immune response similar to protein vaccines but may require more than one dose due to primary failure

- Live vaccines are more susceptible to maternal antibodies compared to killed vaccines

If multiple live vaccines are to be given, they should be administered simultaneously at multiple sites or separated by at least 4 weeks

---X-----X---

Q: Adverse Reactions Following Vaccines in the National Immunization Schedule in India

Vaccine	Adverse Reactions	Additional Information
General	Adverse events can range from mild to severe and can occur with any vaccine.	An Adverse Event Following Immunization (AEFI) is defined as any untoward medical occurrence that follows immunization.
BCG (<i>Bacillus Calmette-Guérin</i>)	Local Abscess, Lymphadenopathy	AEFI surveillance is generally a passive system in India.
DPT (<i>Diphtheria, Pertussis, Tetanus</i>)	Fever, Local Swelling and Redness, Irritability	Operational Guidelines for Surveillance and Response to AEFI provide the framework.
Hepatitis B	Soreness, Mild Fever	Mild systemic adverse events such as low-grade fever are reported in about 10-30% of vaccines.
Hib (<i>Haemophilus influenzae type b</i>)	Fever, Redness or Swelling	Symptoms usually begin within days after vaccination and last for 5–10 days.
IPV (<i>Inactivated Polio Vaccine</i>)	Localized Pain, Anaphylaxis	Severe adverse reactions like anaphylaxis are rare.
MMR (<i>Measles, Mumps, Rubella</i>)	Fever, Rash, Joint Pain	Immediate hypersensitivity reactions are rare but can include symptoms like rash.
Rotavirus	Diarrhea, Vomiting	Intussusception is a severe but rare adverse reaction.
PCV (<i>Pneumococcal Conjugate Vaccine</i>)	Fever, Irritability, Redness, Swelling	Part of the National Regulatory Authority (NRA) for vaccines in India.

Varicella (Chickenpox)	Rash, Fever	Immediate hypersensitivity or anaphylactic reactions are rare.
Typhoid Conjugate Vaccine	Fever, Local Pain	Neurologic disease like YEL-AND is a severe but rare adverse reaction.
Japanese Encephalitis	Fever, Local Reactions	83 AEFI cases reported, some associated with fatality but not causally related.
Hepatitis A	Soreness, Headache	Characterized by symptoms like urticaria and bronchospasm.
HPV (Human Papillomavirus)	Pain, Dizziness	Brief episodes of dizziness are common.
Pentavalent Vaccine (DPT + Hib + Hep B)	Fever, Irritability	Hypotonic-hyporesponsive episode (HHE), Febrile seizures, Thrombocytopenia, Anaphylaxis

Additional Information:

- The AEFI surveillance system in India is generally a passive system designed to enable spontaneous reporting of all adverse events. It is a part of the National Regulatory Authority (NRA) for vaccines in India.
- Operational Guidelines for Surveillance and Response to AEFI provide the framework for the AEFI surveillance system in India.
- Mild systemic adverse events such as low-grade fever, headache, and myalgias are reported in about 10-30% of vaccines. These symptoms usually begin within days after vaccination and last for 5–10 days.

Severe adverse reactions are rare but can include immediate hypersensitivity reactions, characterized by symptoms like rash, urticaria, and bronchospasm

---X-----X---

Q: Describe briefly various adverse reactions following vaccinations and discuss their management

Type of Reaction	Common Vaccines	Brief Description	Management Strategies
------------------	-----------------	-------------------	-----------------------

Local Reactions	BCG, DPT, Hep B, PCV	Formation of abscess, redness, swelling, and pain at the injection site.	Cold compress, topical analgesics.
Systemic Reactions	DPT, Hep B, PCV	Fever within 48 hours, irritability.	Antipyretics like paracetamol, rest, and hydration.
Allergic Reactions	IPV, MMR	Anaphylaxis, rash, urticaria.	Epinephrine for anaphylaxis, antihistamines for mild reactions.
Gastrointestinal Reactions	Rotavirus	Mild to moderate diarrhea and vomiting.	Oral Rehydration Solution (ORS).
Neurological Reactions	DPT, Measles	Febrile seizures, joint pain in adolescent females.	Anticonvulsants for seizures, under medical supervision.
Other Reactions	Hep A, HPV	Headache, dizziness.	Symptomatic treatment with analgesics.

-----X-----X-----

Q: Combination vaccine

- **Definition:** Combination vaccines contain multiple antigens to protect against more than one disease with a single injection. They are formulated to reduce the number of shots a person needs.
- **Advantages:**
 - Reduces the number of injections, thereby improving compliance.
 - Simplifies the immunization schedule.
 - May reduce the cost of storage, distribution, and administration.
- **Challenges:**
 - Potential for increased adverse reactions.
 - Complexity in understanding the immunization schedule.
 - Regulatory hurdles for approval.
- **Examples:**

- **MMR:** Protects against Measles, Mumps, and Rubella.
- **DTaP:** Diphtheria, Tetanus, and Pertussis.
- **Pentavalent Vaccine:** Diphtheria, Tetanus, Pertussis, Hepatitis B, and Haemophilus influenzae type b.
- **Hexavalent Vaccine:** Adds injectable Polio to the Pentavalent combination.
- **Safety and Efficacy:**
 - Generally as effective as individual vaccines.
 - Adverse reactions are usually not significantly higher than individual vaccines.
- **Regulatory Guidelines:**
 - Must meet the safety and efficacy standards for each individual component.
 - Subject to rigorous testing and approval by bodies like the FDA, EMA, and WHO.
- **Public Health Impact:**
 - Facilitates higher vaccination rates.
 - Aids in the eradication or control of multiple diseases simultaneously.
- **Indian Context:**
 - Pentavalent vaccine is part of the Universal Immunization Program (UIP).
 - Introduction of combination vaccines like IPV (Inactivated Polio Vaccine) with DTwP.
- **Future Prospects:**
 - Development of new combination vaccines, such as those including protection against emerging infectious diseases.
 - Research on optimizing the immunization schedule for maximum efficacy.

MMRV combination problems

- **Definition:** The MMRV vaccine is a combination vaccine that protects against four diseases: Measles, Mumps, Rubella, and Varicella (chickenpox).

- **Advantages:**
 - Simplifies the immunization schedule.
 - Reduces the number of injections, improving compliance.
- **Challenges and Problems:**
 - **Increased Risk of Febrile Seizures:** Studies have shown that the MMRV vaccine is associated with a slightly higher risk of febrile seizures occurring 5-12 days after the first dose, compared to separate MMR and Varicella vaccines.
 - **Cost:** MMRV can be more expensive than separate vaccines, which could be a barrier in some settings.
 - **Availability:** Not universally available in all countries or may be in short supply.
 - **Immunogenicity Concerns:** There is ongoing research to ensure that the combination vaccine does not compromise the efficacy of any of its individual components.
- **Management of Problems:**
 - **Risk Assessment:** Healthcare providers often assess the risk of febrile seizures and other adverse reactions, especially if there is a family history.
 - **Alternative Scheduling:** Some guidelines recommend giving the MMR and Varicella vaccines separately for the first dose to children who are at higher risk for febrile seizures.
 - **Symptomatic Treatment:** Management of febrile seizures usually involves treating the fever and ensuring the child is in a safe environment during the seizure.
 - **Informed Consent:** Parents should be informed about the risks and benefits of MMRV versus separate injections.
- **Guidelines and Recommendations:**
 - The CDC recommends that either MMRV or separate MMR and Varicella vaccines can be used for children aged 12 months to 12 years.
 - The American Academy of Pediatrics (AAP) also provides guidelines on the use of MMRV, including considerations for its use in special populations.

Hexavalent combination vaccine advantages and problems

- **Definition:** Hexavalent vaccines are combination vaccines that protect against six diseases: Diphtheria, Tetanus, Pertussis (Whooping Cough), Hepatitis B, Haemophilus influenzae type b (Hib), and Polio.

Advantages:

- **Simplification of Immunization Schedule:** Reduces the number of injections, making it easier for parents to adhere to vaccination schedules.
- **Improved Compliance:** Fewer visits to healthcare providers increase the likelihood of completing the vaccination series.
- **Reduced Pain and Discomfort:** Fewer injections mean less pain and distress for the child.
- **Cost-Effectiveness:** Although the upfront cost may be higher, the reduced number of healthcare visits and potential for better compliance can make it cost-effective in the long run.
- **Broad Spectrum of Protection:** Offers protection against multiple diseases, some of which can be severe or fatal.

Problems:

- **Adverse Reactions:** As with any vaccine, there is a risk of adverse reactions, although these are generally mild and temporary.
- **Complexity in Manufacturing:** The production of hexavalent vaccines is complex, making them more expensive to produce.
- **Limited Availability:** May not be available in all countries or may be in short supply.
- **Interference Between Antigens:** There is a theoretical risk that the effectiveness of one component could be compromised, although this has not been substantiated in clinical trials.
- **Cost:** The upfront cost of the hexavalent vaccine can be higher than individual vaccines, which could be a barrier in some settings.

Management of Problems:

- **Monitoring for Adverse Events:** Post-vaccination, children should be monitored for any adverse reactions, and symptomatic treatment should be provided as necessary.



- **Risk Assessment:** Healthcare providers should assess the risk of adverse reactions, especially in children with a history of vaccine reactions.
- **Informed Consent:** Parents should be informed about the risks and benefits of the hexavalent vaccine versus separate injections.

DTwP vs DTaP in Hexavalent Combination

DTwP (Diphtheria, Tetanus, Whole-cell Pertussis)

- **Components:** Contains whole-cell pertussis component.
- **Efficacy:** Generally considered to provide a slightly higher level of immunity against pertussis.
- **Adverse Reactions:** Higher incidence of fever, irritability, and local reactions like swelling and redness at the injection site.
- **Cost:** Typically less expensive to produce and purchase.
- **Availability:** More commonly used in low-income countries due to cost-effectiveness.
- **Suitability:** Not recommended for children with a history of neurological conditions or severe allergic reactions to any component of the vaccine.

DTaP (Diphtheria, Tetanus, Acellular Pertussis)

- **Components:** Contains acellular pertussis component.
- **Efficacy:** Slightly less effective in providing long-term immunity against pertussis but still highly effective.
- **Adverse Reactions:** Lower incidence of adverse reactions like fever and local site reactions.
- **Cost:** More expensive to produce and purchase.
- **Availability:** More commonly used in high-income countries.
- **Suitability:** Generally better tolerated and can be used in children with a wider range of medical histories.

Comparison in Hexavalent Combination

- **Safety Profile:** Hexavalent vaccines containing DTaP are generally considered to have a better safety profile with fewer adverse reactions.
- **Immunogenicity:** Both DTwP and DTaP in hexavalent combinations have shown good immunogenicity for all included antigens.

- **Public Health Policy:** The choice between DTwP and DTaP in hexavalent vaccines often depends on public health policy, cost considerations, and availability.

Individual Considerations: Medical history, including any prior adverse reactions to vaccines, should be considered when choosing between DTwP and DTaP.

---X-----X---

Q: Write the differences in efficacy, duration of protection and adverse effects between whole cell and acellular pertussis vaccine.

Comparison between Whole Cell and Acellular Pertussis Vaccines

Parameter	Whole Cell Pertussis Vaccine (wP)	Acellular Pertussis Vaccine (aP)
Efficacy	High efficacy (80-90%)	Slightly lower efficacy (70-85%)
Duration of Protection	Longer-lasting immunity (6-10 years)	Shorter duration (4-6 years)
Local Adverse Effects	More frequent: Pain, redness, swelling at injection site	Less frequent: Pain, redness, swelling at injection site
Systemic Adverse Effects	More common: Fever, irritability, drowsiness	Less common: Fever, irritability
Severe Adverse Effects	Rare: Seizures, encephalopathy, hypotonic-hyporesponsive episodes	Rare: Extensive limb swelling, anaphylaxis
Allergic Reactions	Less common	More common due to purer antigenic components
Acceptability	Lower due to higher rate of adverse effects	Higher due to fewer and milder adverse effects
Composition	Contains whole, killed (inactivated) Bordetella pertussis bacteria	Contains purified components of B. pertussis bacteria
Usage History	Widely used until the 1990s; replaced in many countries due to side effect concerns	Introduced in the 1990s; now predominant in many countries
Cost	Less expensive to produce	More expensive due to purification process

Immunization Schedule	Administered in multiple doses, typically as part of the DTP vaccine	Administered in multiple doses, typically as part of the DTaP vaccine for children and Tdap for adolescents and adults
------------------------------	--	--

---X-----X---

Q: Vaccine Vial Monitor (VVM)

Definition:

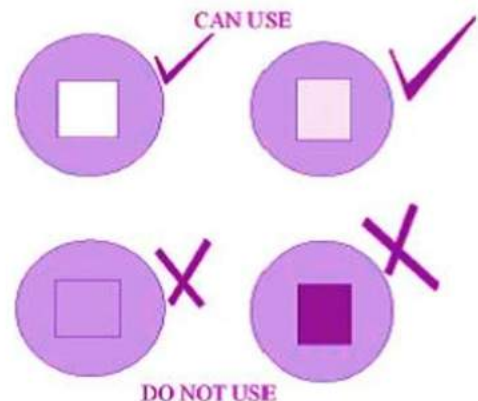
- **Vaccine Vial Monitor:** A label containing a heat-sensitive material that is placed on a vaccine vial to register cumulative heat exposure over time.

Types:

- **Type 6:** Used for vaccines stable at higher temperatures (e.g., Hepatitis B).
- **Type 7:** Used for vaccines moderately sensitive to heat (e.g., DTP, Hib).
- **Type 14:** Used for vaccines highly sensitive to heat (e.g., Oral Polio Vaccine).

Indicators:

- **Initial State:** A circle within a square, both of the same color, indicating that the vaccine is safe to use.
- **Intermediate State:** The circle starts to darken, indicating possible exposure to heat but still safe to use if the circle is lighter than the square.
- **End Point:** The circle becomes darker than or equal to the square, indicating that the vaccine should not be used.



Advantages:

- **Cost-Effective:** Enables better vaccine management and reduces waste.
- **User-Friendly:** Easy to interpret, requiring minimal training for healthcare workers.
- **Quality Assurance:** Ensures that only potent vaccines are administered.

Limitations:

- **Single Parameter:** Only monitors heat exposure, not freezing.

- **Initial Cost:** Adds to the initial cost of vaccine procurement.

Management:

- **Storage:** Vaccines with VVM should still be stored according to the manufacturer's guidelines.
- **Decision Making:** VVM serves as an additional tool but should not replace standard vaccine handling protocols.

Regulatory Guidelines:

- **WHO:** Recommends the use of VVMs for all vaccines in the Expanded Programme on Immunization (EPI).

UNICEF: Requires that all vaccines supplied through them have VVMs.

---X-----X---

Q: Tabulate the various newer vaccines available to prevent respiratory disease in children, with their types, dosage schedule, route, important side effects and efficacy.

Newer Vaccines for Preventing Respiratory Diseases in Children

Vaccine	Type	Dosage Schedule	Route	Important Side Effects	Efficacy
PCV13/PCV 10 (Pneumococcal Conjugate Vaccine)	Conjugate	6,10,14 weeks and 15 months	Intramuscular	Fever, irritability, redness at injection site	80-90%
RSV (Respiratory Syncytial Virus) Palivizumab	Monoclonal Antibody	Monthly during RSV season for high-risk infants	Intramuscular	Rash, fever	45-80%
Influenza Vaccine	Inactivated/ Live attenuated	Annually from 6 months of age	Intramuscular/ Intranasal	Fever, soreness at injection site	40-60%

HMPV (Human Metapneumovirus) Under Trial	Subunit	Under Trial	Under Trial	Under Trial	Under Trial
Pneumococcal Protein-Based Vaccine	Protein-Based	Under Trial	Intramuscular	Under Trial	Under Trial
COVID-19 (Pfizer-BioNTech, Moderna)	mRNA	2 doses, 3-4 weeks apart (12 years and older)	Intramuscular	Fatigue, headache, muscle pain	90-95%

Note:

- **PCV13**: Protects against 13 types of pneumococcal bacteria.
- **RSV Palivizumab**: Recommended for premature infants and children with certain health conditions.
- **Influenza Vaccine**: Both inactivated and live attenuated forms are available.
- **HMPV**: Still under clinical trials.
- **Pneumococcal Protein-Based Vaccine**: Aims to provide broader protection than PCV13.
- **COVID-19 Vaccines**: Emergency use authorization for children aged 12 and older.

---X-----X---

Q: Salient Differences Between Govt. of India National Immunization Schedule and IAP (Indian Academy of Pediatrics) Immunization Schedule

Aspect	Govt. of India National Immunization Schedule	IAP Immunization Schedule
Coverage	Universal, aimed at mass immunization	More individualized, often used in private healthcare settings
Number of Vaccines	Limited number of vaccines, focuses on essential vaccines like BCG, OPV, DPT, etc.	Includes a broader range of vaccines, including optional ones like HPV, Typhoid, and Chickenpox

Age Groups	Primarily focuses on infants and children up to 5 years	Extends to adolescents and sometimes adults
Hepatitis B	Birth dose followed by two more doses	Birth dose followed by three more doses
Rotavirus	2-dose schedule in some states	2 or 3-dose schedule depending on the brand
Pneumococcal Vaccine	Limited to certain states, 3 primary doses	3 primary doses and a booster
Influenza	Not included	Annual vaccination recommended from 6 months of age
HPV	Not included	Recommended for adolescent girls
Catch-up Immunization	Limited guidelines	Detailed catch-up schedules for missed doses
Booster Doses	Fewer booster doses	More booster doses for certain vaccines like DTP and Hib
MMR	Single dose at 9 months	Two doses, first at 9 months and second at 15 months
Varicella	Not included	One dose at 15-18 months, another at 4-6 years
Cost	Free of cost under Universal Immunization Program	May incur costs, especially for optional vaccines

Notes:

- **Govt. of India National Immunization Schedule:** This is the schedule followed in government healthcare settings and aims to provide mass immunization against preventable diseases. It is part of the Universal Immunization Program (UIP).

IAP Immunization Schedule: This schedule is often followed in private healthcare settings and offers a more comprehensive list of vaccines, including those that are not part of the UIP.

-----X-----X-----

Q: Describe the criteria or conditions to be considered for approving a 'newer' vaccine in an immunization program of a developing country

Criteria /Conditions for Approving a 'Newer' Vaccine in an Immunization Program of a Developing Country like India

Efficacy and Safety

- Demonstrated high efficacy in preventing the targeted disease.
- Favorable safety profile with minimal adverse effects.

Cost-Effectiveness

- Cost-benefit analysis showing that the vaccine is economically viable.
- Affordability in the context of the country's healthcare budget.

Disease Burden

- High prevalence or incidence of the disease in the target population.
- Potential for outbreak or epidemic.

Immunogenicity

- Strong and long-lasting immune response.
- Compatibility with existing vaccines in the schedule.

Storage and Stability

- Suitable for the existing cold chain infrastructure.
- Long shelf-life and stability under varying conditions.

Public Health Impact

- Potential to significantly reduce morbidity and mortality.
- Herd immunity benefits.

Ethical Considerations

- Equitable access for all demographic groups.
- Informed consent and autonomy of the recipients.

Regulatory Approval

- Approval from national and international regulatory bodies like WHO.
- Compliance with Good Manufacturing Practices (GMP).



Feasibility of Implementation

- Ease of administration.
- Availability of trained healthcare workers for vaccine delivery.

Monitoring and Surveillance

- Robust post-marketing surveillance system for adverse events.
- Mechanisms for monitoring vaccine coverage and effectiveness.

Political and Social Acceptability

- Political will and commitment for vaccine introduction.
- Public acceptance and demand for the vaccine.

Adaptability

- Flexibility to be incorporated into existing immunization schedules.
- Compatibility with other public health interventions.

Global Recommendations

- Endorsement by global health organizations and alignment with global health goals.

Pilot Testing

- Successful completion of pilot studies in localized settings within the country.

Intellectual Property and Licensing

- Clear legal frameworks for intellectual property rights and licensing agreements.

Note:

The introduction of a new vaccine into a national immunization program is a complex process that involves multiple stakeholders, including government agencies, healthcare providers, and the community. It requires rigorous scientific evaluation, economic analysis, and logistical planning.

---X-----X---

Q: Define and describe the following: a. Herd immunity b. Herd effect c. Vaccine immunogenicity d. Vaccine efficacy; and e. Vaccine effectiveness f. Vaccine potency g. AEFI

Definitions and Descriptions

a. Herd Immunity

- **Definition:** Herd immunity refers to the resistance of a population to the spread of an infectious disease when a sufficiently high proportion of individuals are immune, either through vaccination or natural infection.
- **Description:**
 - Achieved when a critical mass of the population is immune.
 - Reduces the overall transmission of the disease.
 - Protects vulnerable individuals who cannot be vaccinated, such as infants and immunocompromised persons.

b. Herd Effect

- **Definition:** Herd effect is the indirect protection from infectious disease that occurs when the vaccination of a significant portion of a population provides a measure of protection for individuals who have not been vaccinated.
- **Description:**
 - Similar to herd immunity but focuses on the observed epidemiological data.
 - May include non-immune individuals in the protective network.
 - Can be measured through reduced disease incidence in a community.

c. Vaccine Immunogenicity

- **Definition:** Vaccine immunogenicity refers to the ability of a vaccine to provoke an immune response in the body.
- **Description:**
 - Assessed through the measurement of antibodies or T-cell responses.
 - May vary based on age, health status, and other vaccines administered.
 - A key factor in vaccine development and approval.

d. Vaccine Efficacy

- **Definition:** Vaccine efficacy is the percentage reduction of disease in a vaccinated group compared to an unvaccinated group under optimal conditions, usually in a randomized controlled trial.
- **Description:**
 - Expressed as a percentage.
 - Assessed in controlled, ideal conditions.
 - Provides the basis for regulatory approval.

e. Vaccine Effectiveness

- **Definition:** Vaccine effectiveness refers to how well a vaccine performs in real-world conditions.
- **Description:**
 - Evaluated post-licensure.
 - Influenced by various factors like storage conditions, population demographics, and healthcare infrastructure.
 - May differ from vaccine efficacy due to real-world variables.

f. Vaccine Potency

- **Definition:** Vaccine potency is the measure of the vaccine's strength or biological activity.
- **Description:**
 - Quantified through in vitro or in vivo assays.
 - Ensures that the vaccine meets the minimum criteria for effectiveness.
 - Monitored throughout the vaccine's shelf-life.

g. AEFI (Adverse Events Following Immunization)

- **Definition:** AEFI stands for Adverse Events Following Immunization, which are any untoward medical occurrences that follow vaccination.
- **Description:**
 - May or may not be causally related to the vaccine.
 - Can range from mild (e.g., sore arm) to severe (e.g., anaphylaxis).

Monitoring AEFIs is crucial for vaccine safety surveillance.

---X-----X---

Q: Cold Chain

Definition

- **Definition and Importance of Cold Chain:** The "cold chain" is the system of transporting and storing vaccines within recommended temperature from the place of manufacture to the point of administration.
- It comprises three main components: personnel, equipment, and procedures.
- Cold chain breaches can occur due to technical malfunctions but can be managed effectively if good procedures are in place. Maintaining the cold chain is crucial as vaccines and toxoids are made up of proteins, nucleic acids, lipids, and carbohydrates, which may become less effective or even destroyed when exposed to temperatures outside the recommended range.
- **Optimal Temperature Ranges:** For refrigerated vaccines, the optimal temperature is between +2°C and +8°C. For frozen vaccines, the optimal temperature is -15°C or lower. Protection from light is also necessary for some vaccines.
- **Equipment Used in Cold Chain:**
 - **Deep Freezers:** Maintain a temperature between -18°C and -20°C.
 - **ILR (Ice-Lined Refrigerators):** Maintain a temperature between +2°C to +8°C and are used for storing vaccines like BCG, DPT, DT, TT, measles, and Hep B.
 - **Cold Box:** Used for transport or in case of power failure, maintains a temperature between +2°C to +8°C.
 - **Vaccine Carriers:** Used by health workers for carrying vaccines to sub-centers or villages, maintaining the cold chain during transport from the PHC for 1-day use in the field.
 - **Walk-in Coolers:** Used for bulk storage of vaccines at state and regional stores, typically controlled between 2°C and 8°C.
- **Domestic Refrigerators:** Not recommended for vaccine storage as they do not have accurate temperature controlling systems. Temperature varies significantly every time the door is opened, rises during defrosting, and is easily affected by ambient temperature.
- **Temperature Monitoring:** Monitoring of temperature is a critical and integral part of any cold chain system. The expensive equipment installed may become

meaningless unless meticulous temperature records document its proper working.

- **Training and Protocols:** All staff that handle or administer vaccines should be trained in proper vaccine storage and handling practices. Routine protocols should include all aspects of day-to-day vaccine management, from ordering vaccines, controlling inventory, handling vaccines, and monitoring storage conditions.
- **Challenges and Risks:** Different surveys, studies, and site visits have found that about 17–37% of healthcare providers expose vaccines to improper storage temperatures. This can result in a loss of public confidence in vaccines and the healthcare system.
- **Efficient Vaccine Management Protocols:** Should include ordering and accepting vaccine deliveries, controlling inventory, handling vaccines, and monitoring storage conditions.
- **Components:**
 - Refrigerators and freezers
 - Cold boxes and vaccine carriers
 - Temperature monitoring devices
 - Storage facilities
 - Transport logistics
- **Temperature Ranges:**
 - +2°C to +8°C for most vaccines
 - -15°C to -25°C for some vaccines like Varicella
 - -60°C to -80°C for ultra-low temperature vaccines like some COVID-19 vaccines
- **Monitoring and Control:**
 - Use of Vaccine Vial Monitors (VVMs) to indicate heat exposure.
 - Digital data loggers for continuous temperature monitoring.
 - Regular maintenance and calibration of equipment.
- **Importance:**



- Maintains vaccine potency and efficacy.
- Reduces vaccine wastage.
- Ensures the success of immunization programs.
- **Challenges:**
 - Infrastructure limitations in low-resource settings.
 - Energy supply for maintaining temperature.
 - Human errors in monitoring and recording.
- **Innovations:**
 - Solar-powered refrigerators.
 - Real-time GPS and temperature tracking.
 - Use of phase-change materials for better temperature control.

The cold chain is an essential aspect of immunization programs, ensuring the efficacy and safety of vaccines from the manufacturer to the end-user. It involves a complex interplay of personnel, equipment, and procedures, each of which must function optimally to maintain vaccine integrity.

---X-----X---

Q: Components of cold chain for immunisation in a hospital setting and its monitoring

Cold Chain Components

- **Walk-in Cooler/Freezer:** For bulk storage of vaccines, usually located in a central storage facility.
- **Ice-lined Refrigerators (ILRs):** For storing vaccines at the periphery level where electricity is reliable.
- **Deep Freezers:** For storing ice packs and certain types of vaccines that require ultra-low temperatures.
- **Cold Boxes:** Portable boxes for short-term transportation of vaccines.
- **Vaccine Carriers:** Smaller, portable containers for carrying vaccines from the storage facility to the immunization site.
- **Ice Packs:** Used to maintain the temperature inside cold boxes and vaccine carriers.

- **Temperature Monitoring Devices:** Such as Vaccine Vial Monitors (VVMs), Digital Data Loggers, and Cold Chain Monitors (CCMs).
- **Monitoring Mechanisms**
 - **Temperature Logs:** Daily recording of temperatures in all cold storage units.
 - **Vaccine Vial Monitors (VVMs):** Attached to vaccine vials to indicate exposure to heat.
 - **Digital Data Loggers:** Electronic devices that record temperatures at regular intervals.
 - **Cold Chain Monitors (CCMs):** Chemical indicators that change color when exposed to temperatures outside the recommended range.
 - **Visual and Audio Alarms:** Installed in cold storage units to alert staff when temperatures deviate from the recommended range.
 - **Regular Audits and Inspections:** To ensure all components are functioning as intended.

Staff Training: Regular training sessions for healthcare workers involved in vaccine storage and handling.

---X-----X---

Q: Conjugate vaccine

Conjugate vaccines represent a significant advancement in the field of immunization, offering improved immunogenicity and long-lasting protection compared to their polysaccharide counterparts.

They have become an integral part of immunization programs worldwide, including in India, where they address critical public health challenges

- **Concept and Development of Conjugate Vaccines:**
 - Conjugate vaccines were developed to overcome the limitations of polysaccharide vaccines
 - In these vaccines, individual polysaccharides from a set of specific serotypes are conjugated to carrier proteins

- This makes them immunogenic in infants, confers more long-lasting protection, and induces immunological memory
- The carrier proteins used are often cross-reactive material (CRM197), a nontoxic mutant diphtheria toxin, diphtheria toxoid, tetanus toxoid, or a meningococcal outer membrane protein complex.
- **Types and Composition:** There are different types of conjugate vaccines, such as those containing 7, 10, or 13 serotypes of Pneumococcus (PCV-7, PCV-10, PCV-13). The serotype composition and the protein carriers for these vaccines can vary.
 - For example, Vi-PS conjugate typhoid vaccines have been licensed in India, solving the issue of administration below 2 years and incorporation in programmatic schedules in nations with high endemicity of typhoid fever.
- **Mechanism of Action:**
 - Conjugation of the polysaccharide with a protein carrier significantly improves the immune response
 - The conjugate vaccines induce a T-cell dependent immune response, which is more robust and long-lasting compared to the T-cell independent response generated by polysaccharide vaccines.
- **Licensed Vaccines in India:**
 - Various conjugate vaccines have been licensed in India, including Typbar-TCV by Bharat Biotech and Zyvax TCV by Cadila Healthcare for typhoid
 - These vaccines have shown robust evidence regarding safety and vaccine efficacy
 - Meningococcal conjugate vaccines are also available, including a quadrivalent vaccine Menactra from Sanofi Pasteur and a monovalent serogroup A vaccine from Serum Institute of India.
- **Public Health Perspectives:** Conjugate vaccines have a critical role in containing future epidemics of diseases like meningococcal disease. They are preferred over polysaccharide vaccines for their ability to induce long-term protection against bacterial diseases.
- **Safety and Efficacy:**
 - Conjugate vaccines have generally shown a good safety profile

- For example, a double-blind, placebo-controlled, and randomized efficacy study was conducted in children for a Vi conjugate typhoid vaccine, showing no significant local reactions or high temperatures in recipients.
- **Challenges and Future Directions:**
 - While conjugate vaccines have revolutionized the field of immunization, challenges remain in terms of cost, especially for low-income countries
 - Further research is also needed to explore the full potential of conjugate vaccines in preventing a broader range of diseases.

---X-----X---

Q: Pentavalent Vaccines

Definition

- **Pentavalent Vaccine:** A combination vaccine that protects against five major diseases: Diphtheria, Pertussis (Whooping Cough), Tetanus, Hepatitis B, and Haemophilus influenzae type b (Hib).

Components

- **Diphtheria Toxoid:** For Diphtheria prevention
- **Tetanus Toxoid:** For Tetanus prevention
- **Acellular Pertussis:** For Whooping Cough prevention
- **Recombinant Hepatitis B:** For Hepatitis B prevention
- **Hib Conjugate Vaccine:** For Haemophilus influenzae type b prevention

Dosage Schedule

- **Primary Series:** Three doses usually given at 6, 10, and 14 weeks of age
- **Booster Doses:** Not applicable for all components HiB; At 18 months and 5 yrs of age
 - The vaccination schedule for Hib consists of three doses when initiated below 6 months, two doses between 6 months and 12 months, and one dose between 12 months and 15 months, with a booster at 16–18 months.
 - For children aged more than 15 months, a single dose may suffice.

Route of Administration

- Intramuscular injection, usually in the anterolateral aspect of the thigh in infants

Important Side Effects

- **Local Reactions:** Pain, redness, and swelling at the injection site
- **Systemic Reactions:** Fever, irritability, vomiting
- **Severe Reactions:** Anaphylaxis is rare but serious

Efficacy

- **Diphtheria:** 90-95% effective
- **Tetanus:** >95% effective
- **Pertussis:** 80-85% effective
- **Hepatitis B:** 90-95% effective in preventing infection
- **Hib:** >95% effective in preventing invasive disease

Advantages

- Reduces the number of injections needed
- Simplifies logistics and storage
- Increases compliance and coverage rates

Challenges

- Adverse events following immunization (AEFI) need to be monitored
- Slightly higher cost compared to individual vaccines

Potential for reduced efficacy due to interactions between components (though generally not a significant issue)

---X-----X---

Q: Adolescent vaccination

Adolescent Vaccination

Importance

- **Critical Period:** Adolescence is a critical period for updating vaccinations and introducing new vaccines.

- **Lifestyle Risks:** Adolescents may engage in behaviors that increase their risk of certain infections.
- **Long-term Protection:** Provides long-term protection against diseases that may occur in adulthood.

Recommended Vaccines

1. **Tdap (Tetanus, Diphtheria, Pertussis)**

- **Dosage:** Single dose
- **Route:** Intramuscular
- **Side Effects:** Local pain, mild fever
- **Efficacy:** >90%

2. **HPV (Human Papillomavirus)**

- **Dosage:** 2-3 doses depending on age at first dose
- **Route:** Intramuscular
- **Side Effects:** Local pain, mild fever
- **Efficacy:** >90% in preventing HPV-related cancers

3. **Meningococcal Conjugate Vaccine**

- **Dosage:** 1-2 doses
- **Route:** Intramuscular
- **Side Effects:** Local pain, mild fever
- **Efficacy:** 85-90%

4. **Influenza**

- **Dosage:** Annual
- **Route:** Intramuscular or intranasal
- **Side Effects:** Local pain, mild fever
- **Efficacy:** 40-60% depending on strain match

5. **Hepatitis A and B**

- **Dosage:** 2 doses for Hep A, 3 doses for Hep B
- **Route:** Intramuscular

- **Side Effects:** Local pain, mild fever
- **Efficacy:** >90%

6. **Varicella**

- **Dosage:** 2 doses
- **Route:** Subcutaneous
- **Side Effects:** Local pain, mild fever, rash
- **Efficacy:** 80-85%

Optional Vaccines

- **Typhoid**
- **Yellow Fever** (if traveling)
- **Pneumococcal Vaccine** (for high-risk groups)

Route of Administration

- Most vaccines are administered intramuscularly, though some may be subcutaneous or intranasal.

Side Effects

- Common side effects include local pain, redness, and mild fever.
- Serious side effects like anaphylaxis are rare.

Efficacy

- Efficacy varies by vaccine but is generally high for most adolescent vaccines.

Challenges

- **Compliance:** Adolescents may miss scheduled appointments.
- **Awareness:** Lack of awareness among parents and adolescents.

Cost: Some vaccines may be expensive.

---X-----X---

Q: Adverse Events Following Immunization (AEFI)

AEFI Adverse Events Following Immunization, a critical aspect of vaccine pharmacovigilance.



- It includes any untoward medical occurrence following vaccination, not necessarily having a causal relationship with the vaccine.

Etiology

- AEFIs can be caused by the vaccine itself, errors in vaccine handling or administration, or even anxiety related to vaccination.
- They can also be coincidental events that are temporally but not causally related to vaccination.

Pathogenesis

- AEFIs can be categorized into various types based on their cause:
 - Vaccine product-related reaction
 - Vaccine quality defect-related reaction
 - Immunization error-related reaction
 - Immunization anxiety-related reaction
 - Coincidental event

Diagnosis

- Diagnosis involves a thorough case investigation, often initiated as soon as an AEFI is reported.
- Reporting is usually done to the nearest primary health center or the District Immunization Officer.

Management

Reporting and Surveillance

- AEFI surveillance is generally a passive system, enabling spontaneous reporting of all adverse events.
- It is part of the National Regulatory Authority (NRA) for vaccines in India.

Committees and Guidelines

- AEFI committees exist at district, state, and national levels to strengthen reporting and ensure maintenance of standards.
- Operational Guidelines for Surveillance and Response to AEFI provide the framework for the AEFI surveillance system.

Clinical Practice

- The focus is often on system failures rather than individual punitive action.
- Training and capacity building are essential for managing immunization error-related reactions.

Clinical Focus:

- AEFIs can range from minor local reactions like pain and swelling to systemic reactions like fever and irritability.

Serious AEFIs result in outcomes like death, hospitalization, or persistent disability.

---X-----X---

Q: Casualty assessment in AEFI

- ❖ This involves both primary and secondary assessments, focusing on vital parameters and potential clinical manifestations
- ❖ The assessment of a child with AEFI requires a systematic approach, focusing on vital parameters and potential clinical manifestations
- ❖ Early recognition and management of severe reactions like anaphylaxis are critical
- ❖ Continuous monitoring and supportive care are essential, along with appropriate investigations and treatment based on the clinical presentation
- ❖ Communication with the family and documentation of the event are also important for ongoing monitoring and reporting of AEFI.

Primary Assessment (ABCDEF):

1. **Airway:**

- Check for airway patency.
- Manifestations: Stridor, hoarseness, or inability to vocalize may indicate airway compromise, possibly due to an allergic reaction.

2. **Breathing:**

- Assess respiratory rate, effort, and oxygen saturation.
- Manifestations: Tachypnea, dyspnea, wheezing, or hypoxia could suggest respiratory distress, possibly from anaphylaxis or asthma-like reactions.

3. **Circulation:**

- Evaluate heart rate, blood pressure, capillary refill, and pulse quality.
- Manifestations: Tachycardia, hypotension, or prolonged capillary refill time may indicate shock, which can occur in severe allergic reactions.

4. Disability:

- Assess level of consciousness using AVPU scale (Alert, Voice, Pain, Unresponsive).
- Manifestations: Altered mental status can occur in severe cases, possibly due to hypoxia, shock, or neurologic reactions.

5. Exposure/Environment:

- Examine for rashes, hives, or swelling.
- Manifestations: Urticaria or angioedema can be signs of an allergic reaction.

6. Facilitate adjuncts and family:

- Provide supplemental oxygen if needed.
- Reassure and inform the family about the assessment and management steps.

Secondary Assessment:**1. Complete Physical Examination:**

- Thorough examination to identify any other signs of reaction.
- Look for injection site reactions, neurological signs, or signs of systemic illness.

2. History Taking:

- Time of vaccination and onset of symptoms.
- Type of vaccine administered.
- Previous history of AEFIs or allergies.
- Recent illnesses or medications.

3. Vital Signs Monitoring:

- Continuous monitoring of heart rate, respiratory rate, blood pressure, and oxygen saturation.
- Temperature to check for fever or hypothermia.

4. Laboratory Investigations (if indicated):

- RBS, Complete blood count, electrolytes, renal function tests.

- Specific tests based on clinical suspicion (e.g., tryptase levels in suspected anaphylaxis).

5. **Management Based on Findings:**

- Treat specific symptoms (e.g., antihistamines for allergic reactions, fluids for shock).
- Close monitoring for any progression of symptoms.

Consideration for hospitalization if severe reaction is suspected.

-----X-----X-----

Q: Classification of Adverse Events Following Immunization (AEFI)

Temporal Classification

1. **Immediate Reactions:**

- Occur within minutes to hours post-vaccination.
- Examples: Anaphylaxis, urticaria.

2. **Delayed Reactions:**

- Occur days to weeks post-vaccination.
- Examples: Fever, rash.

Causality Classification

1. **Vaccine Product-Related Reactions:**

- Inherent properties of the vaccine.
- Examples: Vaccine-associated paralytic polio (VAPP).

2. **Vaccine Quality Defect-Related Reactions:**

- Due to some fault in the vaccine production, handling, or storage.
- Examples: Bacterial contamination leading to abscess.

3. **Immunization Error-Related Reactions:**

- Errors in vaccine preparation, handling, or administration.
- Examples: Wrong route of administration.

4. **Immunization Anxiety-Related Reactions:**

- Psychological reactions.

- Examples: Hyperventilation, syncope.

5. **Coincidental Events:**

- Not directly related to the vaccine or immunization process.
- Examples: Sudden Infant Death Syndrome (SIDS).

Severity Classification

1. **Mild Reactions:**

- No medical intervention needed.
- Examples: Low-grade fever, mild rash.

2. **Moderate Reactions:**

- May require medical intervention but not life-threatening.
- Examples: High fever, extensive swelling at the injection site.

3. **Severe Reactions:**

- Require immediate medical intervention; could be life-threatening.
- Examples: Anaphylaxis, encephalopathy.

Clinical Classification

1. **Local Reactions:**

- Limited to the site of injection.
- Examples: Pain, swelling, redness.

2. **Systemic Reactions:**

- Affect the entire body or multiple systems.
- Examples: Fever, malaise, myalgia.

Special Classification

1. **Cluster of Events:**

- Multiple cases of AEFI following immunization from the same vaccine batch.
- Requires immediate investigation.

2. **Programmatic Errors:**

- Due to errors in the immunization program itself.

Examples: Reuse of syringes, incorrect diluent.

---X-----X---

Q: Different immunisation campaigns in India and their role in improving immunization coverage

- **Immunization Campaigns**
 - **Role in Improving Immunization Coverage**
- **Mission Indradhanush**
 - Targets seven vaccine-preventable diseases; aims to immunize all children under the age of 2 years and pregnant women.
- **Intensified Mission Indradhanush (IMI)**
 - Focuses on districts with the lowest immunization coverage; aims to reach 90% immunization coverage.
- **Pulse Polio Immunization**
 - Targets the eradication of polio by providing oral polio vaccines to children under 5 years of age.
- **Measles-Rubella (MR) Campaign**
 - Aims to eliminate measles and control rubella by vaccinating children aged 9 months to 15 years with MR vaccine.
- **Rotavirus Vaccination Campaign**
 - Targets the prevention of rotavirus diarrhea; administered to infants in three doses.
- **Pneumococcal Conjugate Vaccine (PCV) Introduction**
 - Aims to reduce child mortality from pneumococcal pneumonia; administered in a 3-dose schedule to infants.
- **Human Papillomavirus (HPV) Vaccine Program**
 - Targets the prevention of cervical cancer; administered to adolescent girls.
- **Japanese Encephalitis (JE) Vaccination Campaign**
 - Aims to control and prevent Japanese Encephalitis; focuses on endemic districts.

- **Hepatitis B Birth Dose Introduction**
 - Targets the prevention of perinatal transmission of Hepatitis B; administered within 24 hours of birth.
- **Typhoid Conjugate Vaccine (TCV) Introduction**
 - Aims to reduce the incidence of typhoid fever; administered to children over 6 months of age.
- **National Deworming Day**
 - Targets soil-transmitted helminthiasis; administered to children aged 1-19 years.
- **Vitamin A Supplementation Program**

Aims to reduce the incidence of Vitamin A deficiency; administered bi-annually to children aged 6 months to 5 years

---X-----X---

Q: Future vaccines

Vaccine	Target Disease	Current Status	Potential Impact
Respiratory Syncytial Virus (RSV) Vaccine	RSV Infections	Clinical Trials	Could significantly reduce infant mortality and hospitalizations related to RSV.
Universal Influenza Vaccine	Influenza	Research and Development	Aims to provide broader and longer-lasting protection against multiple strains of influenza.
Malaria Vaccine (RTS,S/AS01)	Malaria	Limited Deployment	Could substantially reduce malaria-related child mortality in endemic regions.
Dengue Tetravalent Vaccine	Dengue Fever	Approved in Some Countries	Aims to provide balanced protection against all four dengue serotypes.
Zika Virus Vaccine	Zika Virus	Clinical Trials	Could prevent birth defects and neurological complications associated with Zika infection.

HIV Vaccine	Human Immunodeficiency Virus	Clinical Trials	Could be a game-changer in the fight against the HIV/AIDS pandemic.
Group B Streptococcus Vaccine	Group B Streptococcal Infections	Clinical Trials	Aims to prevent neonatal sepsis and meningitis.
Norovirus Vaccine	Norovirus Gastroenteritis	Clinical Trials	Could significantly reduce the incidence of acute gastroenteritis in children.
CMV Vaccine (Cytomegalovirus)	Cytomegalovirus Infections	Clinical Trials	Could prevent congenital CMV infections, a leading cause of sensorineural hearing loss.
Ebola Vaccine	Ebola Virus Disease	Approved for Emergency Use	Could prevent outbreaks and reduce mortality rates associated with Ebola virus.
Tuberculosis Vaccine (Newer Versions)	Tuberculosis	Clinical Trials	Aims to provide more effective and longer-lasting protection than BCG.
Chikungunya Vaccine	Chikungunya Virus	Clinical Trials	Could prevent the spread of chikungunya, especially in endemic regions.
Nipah Virus Vaccine	Nipah Virus Infection	Pre-clinical Development	Could prevent outbreaks of Nipah virus, which has a high mortality rate.

-----X-----X-----

Q: Write briefly about different types of vaccine against rabies

Type of Vaccine	Brand Names	Dosage Schedule	Route of Admin	Efficacy	Common Side Effects	Additional Notes
<i>Inactivated Rabies Virus Vaccines</i>						

HDCV (human diploid cell culture vaccine)	Imovax, RabAvert	Day 0, 7, 21 or 28	IM	High, almost 100% seroconversion	Local pain, erythema, swelling, rare systemic reactions	Widely used for both preand post-exposure
PCECV (purified chick embryo culture vaccine)	Rabipur	Day 0, 7, 21 or 28	IM	Comparable to HDCV	Local pain, erythema, swelling, allergic reactions	Suitable for those allergic to HDCV components
Live-Attenuated Vaccines						
TriGAS	N/A (experimental)	Single dose	IM	Under investigation	Not yet characterized	Not approved for human use
DNA Vaccines						
pGARg	N/A (experimental)	Multiple doses	IM	Under investigation	Not yet characterized	Still in experimental phase
Plant-Based Vaccines						
CTB-RVG	N/A (experimental)	Under investigation	Oral	Under investigation	Not yet characterized	Still in experimental phase
Vero Cell Rabies Vaccine						
PVRV	Verorab, Indirab	Day 0, 7, 21 or 28	IM	Comparable to HDCV	Local pain, erythema, swelling, rare systemic reactions	Suitable for those allergic to HDCV components
Equine Rabies Immunoglobulin						
ERIG	Equirab	Single dose, based on weight	IM	Used with vaccine for immediate protection	Risk of serum sickness, allergic reactions	Used for post-exposure in severe cases
Human Rabies Immunoglobulin						

HRIG	HyperRAB, Imogam	Single dose, based on weight	IM	Used with vaccine for immediate protection	Local pain, possible allergic reactions	Used for post-exposure in severe cases
------	------------------	------------------------------	----	--	---	--

---X-----X---

Q: Discuss various schedules of pre and post-exposure prophylaxis for rabies in detail; Post exposure prophylaxis for dog bite

Pre-Exposure Prophylaxis for Rabies

Intramuscular (IM) Regimen

- **Schedule:** 3 doses of rabies vaccine on Day 0, Day 7, and Day 21 or 28.
- **Vaccine Used:** HDCV (Human Diploid Cell Vaccine) or PCECV (Purified Chick Embryo Cell Vaccine)
- **Dosage:** 1.0 mL per dose
- **Route:** Intramuscular, usually in the deltoid region

Intradermal (ID) Regimen

- **Schedule:** 3 doses on Day 0, Day 7, and Day 21 or 28.
- **Vaccine Used:** HDCV or PCECV
- **Dosage:** 0.1 mL per dose
- **Route:** Intradermal, usually in the deltoid region

Post-Exposure Prophylaxis for Rabies

WHO Category I Exposure

- **Treatment:** No treatment required
- **Rationale:** Touching or feeding animals, licks on intact skin

WHO Category II Exposure

- **Treatment:** Immediate wound cleaning and vaccination
- **Schedule:** 3 doses on Day 0, Day 3, and Day 7
- **Vaccine Used:** HDCV or PCECV
- **Dosage:** 1.0 mL per dose (IM) or 0.1 mL per dose (ID)

- **Route:** Intramuscular or Intradermal

WHO Category III Exposure

- **Treatment:** Immediate wound cleaning, vaccination, and Rabies Immunoglobulin (RIG)
- **Schedule for Vaccine:** 5 doses on Day 0, Day 3, Day 7, Day 14, and Day 28
- **Vaccine Used:** HDCV or PCECV
- **Dosage for Vaccine:** 1.0 mL per dose (IM) or 0.1 mL per dose (ID)
- **Route for Vaccine:** Intramuscular or Intradermal
- **Rabies Immunoglobulin:** HRIG (Human Rabies Immunoglobulin) or ERIG (Equine Rabies Immunoglobulin)
- **Dosage for RIG:** 20 IU/kg (HRIG) or 40 IU/kg (ERIG)
- **Route for RIG:** Infiltration around the wound

Immunocompromised Individuals

- **Treatment:** Immediate wound cleaning, vaccination, and Rabies Immunoglobulin (RIG)
- **Schedule for Vaccine:** 5 doses on Day 0, Day 3, Day 7, Day 14, and Day 28, plus one additional dose on Day 90
- **Vaccine Used:** HDCV or PCECV
- **Dosage for Vaccine:** 1.0 mL per dose
- **Route for Vaccine:** Intramuscular
- **Rabies Immunoglobulin:** HRIG or ERIG
- **Dosage for RIG:** 20 IU/kg (HRIG) or 40 IU/kg (ERIG)

Route for RIG: Infiltration around the wound

---X-----X---

Q: Anti-rabies vaccine – Different schedules, advantages of each schedule; Post exposure prophylaxis for dog bite

Schedule Type	Dosing Schedule	Vaccine Type	Route	Advantages
---------------	-----------------	--------------	-------	------------

Pre-Exposure IM	Day 0, Day 7, Day 21 or 28	HDCV, PCECV	Intramuscular	Long-lasting immunity Suitable for travelers and those at high risk
Pre-Exposure ID	Day 0, Day 7, Day 21 or 28	HDCV, PCECV	Intradermal	Cost-effective Less vaccine volume required
Post-Exposure IM (Essen)	Day 0, Day 3, Day 7, Day 14, Day 28	HDCV, PCECV	Intramuscular	Well-studied Suitable for general population
Post-Exposure ID (Thai Red Cross)	Day 0 (2 doses), Day 3, Day 7, Day 28	HDCV, PCECV	Intradermal	Cost-effective Rapid induction of immunity
Post-Exposure IM (Zagreb)	Day 0 (2 doses), Day 7, Day 21	HDCV, PCECV	Intramuscular	Shorter regimen Less clinic visits required
Post-Exposure ID (Updated Thai)	Day 0, Day 3, Day 7	HDCV, PCECV	Intradermal	Fewer doses Cost-effective
Immunocompromised IM	Day 0, Day 3, Day 7, Day 14, Day 28, Day 90	HDCV, PCECV	Intramuscular	Enhanced protection for immunocompromised individuals

- **HDCV**: Human Diploid Cell Vaccine; **PCECV**: Purified Chick Embryo Cell Vaccine;

IM: Intramuscular; **ID**: Intradermal

-----X-----X-----

Q: Varicella Vaccine

Attribute	Description
Type	Live-attenuated vaccine
Brand Names	Variped, Varivax, ProQuad (MMRV)
Dosage Schedule	First dose: 12-15 months Second dose: 4-6 years

	Catch-up: Two doses 3 months apart for children aged 7-12, and at least 4 weeks apart for those 13 years and older
Route	Subcutaneous injection
Important Side Effects	Mild rash Fever Pain, redness, or swelling at the injection site Anaphylaxis (rare)
Efficacy	85% effective after one dose 98% effective after two doses
Special Considerations	Not recommended for pregnant women Not recommended for immunocompromised individuals

-----X-----X-----

Q: Complications of Measles Vaccination and Management

Complication	Incidence	Clinical Presentation	Management
Local Reactions	Common	Pain, redness, or swelling at the injection site	Cold compress Over-the-counter pain relievers
Fever	Common	Elevated body temperature within 7-12 days post-vaccination	Antipyretics like acetaminophen or ibuprofen Adequate hydration
Febrile Seizures	Rare	Convulsions triggered by high fever	Immediate medical attention Antipyretics and anticonvulsants as prescribed
Thrombocytopenia	Very Rare	Low platelet count leading to easy bruising and bleeding	Hematologic evaluation Platelet transfusion if severe
Anaphylaxis	Extremely Rare	Severe allergic reaction with symptoms like rash, urticaria, and bronchospasm	Epinephrine injection Immediate medical attention

Encephalitis	Extremely Rare	Inflammation of the brain	Hospitalization Antiviral and anti-inflammatory medications
---------------------	----------------	---------------------------	--

Notes:

- The measles vaccine is generally administered as a combination vaccine (MMR or MMRV) that also protects against mumps, rubella, and sometimes varicella.
- The vaccine is contraindicated in individuals with a history of severe allergic reaction to any component of the vaccine or a severely compromised immune system.
- Monitoring for adverse events is crucial, especially within the first 48 hours post-vaccination.

-----X-----X-----

Q: Haemophilus Influenzae Type B (Hib) Vaccine**Haemophilus Influenzae Type B (Hib) Vaccine: An Overview****Introduction**

- Haemophilus Influenzae Type B (Hib) is a bacterial pathogen responsible for severe infections, particularly in children under five years of age.
- The Hib vaccine aims to prevent diseases caused by this bacterium, including meningitis, pneumonia, and epiglottitis.

Types of Hib Vaccines

- **Monovalent Hib vaccine:** Contains only Hib antigen.
- **Combination vaccines:** Often combined with other vaccines like DTP (Diphtheria, Tetanus, Pertussis) to form DTP-Hib or as a part of pentavalent or hexavalent vaccines.

Composition

- Hib polysaccharide conjugated to a protein carrier, often tetanus toxoid or another protein.

Dosage Schedule

- Typically administered in a 3-dose or 4-dose schedule, starting at 2 months of age.
- A booster dose is usually given between 12 and 15 months.

Route of Administration

- Intramuscular injection, often in the anterolateral aspect of the thigh in infants or the deltoid muscle in older children and adults.

Efficacy

- Highly effective in preventing Hib-related diseases, with efficacy rates above 90% after the complete vaccination series.

Disease burden

- Hib is a significant invasive pathogen causing diseases like meningitis, bacteraemia, pneumonia, cellulitis, osteomyelitis, septic arthritis, and epiglottitis.
- Most invasive Hib diseases occur in children in the first two years of life.
- Hib is a common cause of pneumonia and meningitis in India.
- Capsulated *Haemophilus influenzae* has six serotypes, with type b being the most important.
- Hib vaccine induces both humoral and cellular immunity, providing long-lasting protection.
- Vaccine-induced immunity wanes over time, and a booster dose is mandatory for sustained protection.
- The need for Hib vaccination is determined based on the national immunization schedule, age of the child, and risk factors.

Routine Vaccination

- Minimum age for vaccination is 6 weeks.
- Primary series include Hib conjugate vaccine at ages 6, 10, and 14 weeks with a booster at age 12 through 18 months.

Catch-up Vaccination

- Recommended until 5 years of age.
- For children aged 6–12 months, two primary doses 4 weeks apart and one booster are advised.
- For those aged 12–15 months, one primary dose and one booster are recommended.
- For those above 15 months, a single dose is sufficient.

Safety and Adverse Effects

- Side effects are generally mild and local.
- A total of 98 adverse events following immunization (AEFI) episodes were reported for 53.51 million doses from October 2004 through December 2011 in India, suggesting no significant safety concerns.

Clinical Focus

- Hib is the dominant cause of nonepidemic bacterial meningitis during the first year of life.
- Even with prompt and adequate antibiotic treatment, fatality rates for Hib meningitis can be as high as 20–30%.

Haemophilus Influenzae Type B (Hib) Vaccine: Complications and Management

Complication	Incidence	Clinical Presentation	Management
Local Reactions	Common	Pain, redness, or swelling at the injection site	Cold compress Over-the-counter pain relievers like acetaminophen
Fever	Common	Elevated body temperature, usually mild to moderate	Antipyretics like acetaminophen or ibuprofen Adequate hydration
Irritability	Common	Behavioral changes, fussiness	Comfort measures like holding, rocking Consult healthcare provider if persistent
Anaphylaxis	Extremely Rare	Severe allergic reaction with symptoms like rash, urticaria, and bronchospasm	Epinephrine injection Immediate medical attention

Notes:

- The Hib vaccine is often administered as part of a combination vaccine, such as the pentavalent vaccine (DPT + Hib + Hep B).
- The vaccine is contraindicated in individuals with a history of severe allergic reaction to any component of the vaccine.
- Monitoring for adverse events is crucial, especially within the first 48 hours post-vaccination.

Side Effects

- Common: Localized pain, redness, or swelling at the injection site, fever, irritability.
- Rare: Severe allergic reactions like anaphylaxis.

Contraindications

- Severe allergic reaction to a previous dose of the vaccine or any of its components.
- Acute severe febrile illness.

Management of Adverse Reactions

- Local reactions: Cold compress, over-the-counter pain relievers.
- Fever: Antipyretics like acetaminophen or ibuprofen.
- Anaphylaxis: Immediate medical attention and administration of epinephrine.

Public Health Impact

Significant reduction in the incidence of Hib-related diseases since the introduction of the vaccine.

---X-----X---

Q: Tabulate the following details with regards to Rotavirus vaccine, Hep A,B, Varicella, HIB vaccine and pneumococcal vaccine: a) Type of vaccine b) Dose c) Route d) Appropriate age of vaccination e) Justification of its usage f) Side effect and g) Drawback

Vaccine	Dose	Route	Justification of its Usage	Side Effect	Drawback
Rotavirus Live-attenuated	2 or 3 doses	Oral	Prevention of severe rotavirus gastroenteritis	Mild diarrhea, vomiting	Not for immunocompromised
HIB Conjugate vaccine	3-4 doses	IM	Prevention of meningitis, pneumonia, epiglottitis	Pain at injection site, fever	Not for those with prior severe allergic reaction
Varicella -Live-attenuated	2 doses	S/c	Prevention of chickenpox	Mild rash, fever	Not for pregnant or immunocompromised

Hepatitis A - Inactivated	2 doses	IM	Prevention of Hepatitis A infection	Sore arm, headache	Not for those with prior severe allergic reaction
Hepatitis B - Recombinant	3 doses	IM	Prevention of Hepatitis B infection	Sore arm, mild fever	Not for those with prior severe allergic reaction
Pneumococcal - Conjugate/ Polysaccharide	3-4 doses (PCV13)	IM	Prevention of pneumococcal diseases like pneumonia, meningitis	Pain at injection site, mild fever	Not for those with prior severe allergic reaction

-----X-----X-----

Q: Typhoid Vaccines

Vaccine	Type of Vaccine	Dose	Route	Appropriate Age of Vaccination	Justification of its Usage	Side Effect	Drawback
Ty21a (Vivotif)	Live-attenuated	3-4 capsules	Oral	6 years and older	Prevention of typhoid fever	Abdominal discomfort, fever	Not for immunocompromised, not for children under 6 years
ViCPS (Typhim Vi)	Polysaccharide	Single dose	IM	2 years and older	Prevention of typhoid fever	Pain at injection site, fever	Shorter duration of immunity, not for children under 2 years
Vi-TT (Typbar TCV)	Conjugate	Single dose	IM	6 months and older	Prevention of typhoid fever, longer-lasting immunity	Pain at injection site, mild fever	Not for those with prior severe allergic reaction

-----X-----X-----

Q: Typhoid Conjugate Vaccine (TCV)

- Typhoid fever is a significant public health concern, particularly in endemic regions.



- Typhoid Conjugate Vaccines (TCVs) offer a more effective and longer-lasting protection compared to polysaccharide vaccines.

Etiology

- Caused by *Salmonella typhi*, a systemic infection.
- TCVs are designed to offer long-term immunity against this pathogen.

Pathogenesis

- TCVs induce a T-cell dependent immune response.
- Conjugation with proteins like tetanus toxoid enhances immunogenicity.

Vaccine Composition and Types

Typbar-TCV

- Manufactured by Bharat Biotech.
- Contains 25 µg purified Vi-PS of *S. typhi* conjugated to tetanus toxoid.
- Robust evidence regarding safety and vaccine efficacy (VE).

Zyvac TCV

- Manufactured by Cadila Healthcare.

Clinical Trials and Efficacy

- Phase IIa/IIb study showed no significant difference in the geometric mean titers of antibodies between the vaccine and control groups.
- Overall efficacy after 27 months of active surveillance followed by 19 months of passive surveillance was 89%.

Dosage and Administration

- Single-dose administration is standard.
- Some recommend a booster at 3 years.
- Typbar-TCV is available in single-dose vials or prefilled syringes, and five-dose vials.

Safety and Storage

- Each vaccine dose also contains 5 mg of 2-phenoxyethanol as a preservative.
- The manufacturer-recommended storage temperature is 2–8°C.

Clinical Focus: Pediatric Considerations



- TCVs can be administered to children as young as 6 months.
- They offer longer-term protection compared to polysaccharide vaccines.

Public Health Perspectives

TCVs are preferred for their improved immunological properties and applicability in younger children.

-----X-----X-----

Q: Hepatitis B Immunization

It's an oncopreventive vaccine

- Hepatitis B is a significant public health concern, leading to chronic hepatitis, cirrhosis of the liver, and hepatocellular carcinoma (HCC).
- Hepatitis B immunization is crucial for preventing these severe outcomes, especially in children.

Etiology

- Hepatitis B is caused by the Hepatitis B virus (HBV).
- The virus is transmitted through blood and body fluids, making healthcare workers particularly vulnerable.

Pathogenesis

- The vaccine induces immunity against the hepatitis B surface antigen (HBsAg).
- It is produced by recombinant technology in yeast and adjuvanted with aluminum salts.

Vaccine Composition

- The active substance in the vaccine is HBsAg.
- Thimerosal-free vaccines are also available.

Vaccination Schedule

- The standard three-dose series consists of two priming doses administered 1 month apart and a third dose administered 6 months after the first dose.
- Multiple options exist for adding the vaccine to existing national immunization schedules, including birth, 6, and 14 weeks; birth, 6 weeks, 6 months; and birth, 6 weeks, 10 weeks, 14 weeks.

Safety and Storage

- The vaccine should be stored at 2–8°C.
- No significant adverse events have been reported.

Clinical Focus: Pediatric Considerations

- All infants should receive their first dose of hepatitis B vaccine as soon as possible after birth, preferably within 24 hours.
- In countries with high disease endemicity, this is particularly important to prevent perinatal transmission.

Healthcare Workers and Post-Exposure Prophylaxis

- Hepatitis B vaccine should be offered to all healthcare personnel (HCP) who have a reasonable expectation of being exposed to blood and body fluids.
- Post-exposure prophylaxis includes Hepatitis B immunoglobulin (HBIG) and beginning a hepatitis B vaccine series.

Public Health Perspectives

- Hepatitis B vaccination is of great public health significance.
- The World Health Organization (WHO) has recommended universal hepatitis B vaccination.

---X-----X---

Q: Pneumococcal Vaccine

- Pneumococcal infections are a significant cause of morbidity and mortality, especially in children and the elderly.
- Vaccination is a key preventive measure against invasive pneumococcal diseases like pneumonia, meningitis, and sepsis.

Etiology

- Caused by the bacterium *Streptococcus pneumoniae*.
- Over 90 serotypes exist, but a limited number are responsible for most invasive diseases.

Pathogenesis

- The vaccine aims to induce immunity against multiple serotypes of the pneumococcus.
- Two main types of vaccines: Pneumococcal Polysaccharide Vaccine (PPSV) and Pneumococcal Conjugate Vaccines (PCV).

Types of Vaccines

Pneumococcal Polysaccharide Vaccine (PPSV)

- Known as PPSV23, covers 23 serotypes.
- T-cell independent and poorly immunogenic below the age of 2.
- Administered as a 0.5 mL dose either intramuscularly or subcutaneously.
- Stored at 2–8°C.

Pneumococcal Conjugate Vaccines (PCV)

- Overcomes the limitations of PPSV by conjugating polysaccharides to carrier proteins.
- Available in formulations covering 7, 10, or 13 serotypes.
- Induces long-lasting protection and immunological memory.

Vaccination Schedule

PPSV

- Minimum age: 2 years.
- Recommended only for persons with high-risk conditions.
- An additional dose should be administered after 5 years for high-risk individuals.

PCV

- Recommended for all infants.
- Multiple dosing schedules exist, often starting at 2 months of age.

Safety and Adverse Effects

- Both types of vaccines are generally well-tolerated.
- Local side effects are the most common.

Clinical Focus:

- PCVs are preferred for children due to their ability to induce a more robust and long-lasting immune response.
- PPSV is generally not recommended for routine use in healthy children.

Surveillance and Monitoring

Ongoing surveillance is crucial for understanding serotype distribution and vaccine impact.

---X-----X---

Q: Influenza Type B Vaccine

Types:

1. *Trivalent Inactivated Influenza Vaccine (TIV)*

- Composition: Inactivated influenza A (H1N1 and H3N2) and one influenza B virus.
- Administration: Intramuscular injection
- Age Group: Approved for individuals 6 months and older.
- Efficacy: Approximately 60-80% in preventing illness.

2. *Quadrivalent Inactivated Influenza Vaccine (QIV)*

- Composition: Inactivated influenza A (H1N1 and H3N2) and two influenza B viruses.
- Administration: Intramuscular injection
- Age Group: Approved for individuals 6 months and older.
- Efficacy: Slightly higher than TIV due to additional B strain coverage.

3. *Live Attenuated Influenza Vaccine (LAIV)*

- Composition: Live, attenuated influenza A and B viruses.
- Administration: Intranasal spray
- Age Group: Approved for individuals between 2 and 49 years.
- Efficacy: Comparable to inactivated vaccines but not recommended for certain populations like pregnant women and immunocompromised individuals.

Mechanism of Action:

- **Induction of Humoral Immunity:** Both inactivated and live attenuated vaccines stimulate B cells to produce antibodies against influenza virus hemagglutinin.
- **Cell-Mediated Immunity:** Inactivated vaccines primarily stimulate humoral immunity, while LAIV also induces a cell-mediated response.

Adverse Effects:

- **TIV and QIV:** Soreness at injection site, low-grade fever, and muscle aches.
- **LAIV:** Runny nose, headache, sore throat, and low-grade fever.

Contraindications:

- **TIV and QIV:** Severe allergic reaction to a previous dose.
- **LAIV:** Children under 2 years, adults over 49 years, pregnant women, and immunocompromised individuals.

Storage:

- **TIV and QIV:** Stored between 2°C and 8°C.
- **LAIV:** Requires storage at -15°C.

Public Health Impact:

- Significant reduction in hospitalizations due to influenza.
- Herd immunity benefits, particularly for vulnerable populations like infants and the elderly.

Recommendations:

- Annual vaccination is recommended for all individuals over 6 months of age, especially high-risk groups.

Higher Risk Groups for Whom Influenza Vaccine is Strictly Recommended

<i>Risk Group</i>	Rationale for Vaccination
<i>Infants and Children (6 months to 5 years)</i>	Higher risk of severe influenza complications.
<i>Adults 65 years and older</i>	Increased susceptibility and higher mortality rates.
<i>Pregnant Women</i>	Risk of severe illness and pregnancy complications. Protects newborns through passive immunity.
<i>Healthcare Workers</i>	Risk of exposure and potential transmission to vulnerable patients.
<i>Immunocompromised Individuals</i>	Reduced ability to fight infections, higher risk of complications.

<i>Individuals with Chronic Illness</i>	Conditions like asthma, COPD, diabetes, and heart disease increase risk of complications.
<i>Residents of Long-Term Care Facilities</i>	High concentration of vulnerable individuals.
<i>Indigenous Populations</i>	Higher risk of severe illness and complications.
<i>Morbidly Obese Individuals (BMI >40)</i>	Increased risk of complications like pneumonia.
<i>Travelers</i>	Risk of exposure in different geographic regions, especially if traveling to areas with different flu seasons.

Note: Here the scope is beyond pediatric age limits

-----X-----X-----

Q: Post-DPT Vaccine Encephalopathy

Parameter	Description
<i>Definition</i>	Acute neurological disorder following DPT (Diphtheria, Pertussis, Tetanus) vaccination.
<i>Incidence</i>	Extremely rare; estimated 0 to 10.5 cases per million doses.
<i>Onset</i>	Typically within 24-48 hours post-vaccination.
<i>Clinical Features</i>	Altered consciousness, seizures, high-pitched crying, fever, and irritability.
<i>Pathophysiology</i>	Unclear; may involve immune-mediated mechanisms or direct neurotoxicity.
<i>Diagnosis</i>	Clinical presentation and temporal association with DPT vaccination. Exclusion of other causes.
<i>Differential Diagnosis</i>	Febrile seizures, meningitis, encephalitis, metabolic disorders, and pre-existing neurological conditions.
<i>Management</i>	Symptomatic treatment, including antipyretics and anticonvulsants. ICU admission may be necessary.
<i>Prognosis</i>	Variable; may result in permanent neurological damage in severe cases.

<i>Prevention</i>	DTaP (acellular pertussis component) vaccine is used to minimize risk.
<i>Legal Aspects</i>	Vaccine Injury Compensation Program exists for financial compensation.
<i>Public Health Impact</i>	Rare cases can impact vaccine acceptance rates.

---X-----X---

Q: Discuss the current role, advantages and disadvantages of OPV and IPV in control and eradication of poliomyelitis in India

Current Role of OPV and IPV in Control and Eradication of Poliomyelitis in India

- While OPV has been instrumental in bringing India to the brink of polio eradication, its associated risks like VAPP are steering the country towards IPV for routine immunization.
- IPV, with its safety profile and efficacy, is becoming the vaccine of choice for the next phase of polio eradication in India.
- Both vaccines have a crucial role to play in maintaining the country's polio-free status.

Oral Polio Vaccine (OPV)

- Current Role:** OPV has been the cornerstone of mass immunization campaigns like Pulse Polio Immunization (PPI) aimed at eradicating polio. It is administered during National and Sub-National Immunization Days to children under 5 years of age.

Inactivated Polio Vaccine (IPV)

- Current Role:** IPV is integrated into the Universal Immunization Program (UIP) and is administered as part of the routine immunization schedule for infants. It is used to boost immunity and is increasingly replacing OPV for routine immunization.

Advantages

OPV

- Ease of Administration:** Can be administered orally, making it easier to vaccinate large populations.

- **Cost-Effective:** Less expensive to produce and distribute.
- **Community Immunity:** Provides superior herd immunity by immunizing through fecal-oral route.
- **Long-lasting Immunity:** Provides long-lasting immunity with booster doses.

IPV

- **Safety:** No risk of Vaccine-Associated Paralytic Polio (VAPP).
- **Stable:** Less sensitive to temperature changes, easier to store and transport.
- **Efficacy:** Highly effective in inducing immunity.
- **No Live Virus:** Does not contain live virus, making it suitable for immunocompromised individuals.

Disadvantages

OPV

- **VAPP Risk:** Small risk of causing Vaccine-Associated Paralytic Polio.
- **Cold Chain:** Requires a stringent cold chain for storage and transport.
- **Phasing Out:** Being phased out globally, including in India, due to VAPP risk.

IPV

- **Cost:** More expensive to produce and administer.
- **Administration:** Requires trained healthcare workers for intramuscular injection.
- **Limited Herd Immunity:** Does not provide as robust herd immunity as OPV.

---X-----X---

Q: Status of Polio vaccines

Status of Polio Vaccines in India

Parameter	Oral Polio Vaccine (OPV)	Inactivated Polio Vaccine (IPV)
Current Usage	Widely used in National Immunization Days	Included in routine immunization schedule
Type of Vaccine	Live-attenuated; <u>Now bivalent,</u> <u>earlier trivalent</u>	Inactivated

<i>Administration</i>	Oral drops	Intramuscular injection
<i>Efficacy</i>	High (90-95%)	High (90-95%)
<i>Duration of Protection</i>	Long-lasting with booster doses	Long-lasting with booster doses
<i>Adverse Effects</i>	Rare: Vaccine-associated paralytic polio (VAPP)	Rare: Localized swelling, redness
<i>Cost</i>	Lower	Higher
<i>Storage</i>	Requires cold chain	Requires cold chain
<i>Government Initiatives</i>	Pulse Polio Immunization (PPI) campaigns	Integrated into Universal Immunization Program (UIP)
<i>Target Population</i>	Children under 5 years	Children under 5 years
<i>Current Status</i>	Phasing out in favor of IPV	Increasingly being adopted

-----X-----X-----

Q: What is inactivated polio vaccine (IPV). What are the advantages and disadvantages of IPV over OPV? What is the schedule of IPV as recommended by IAP.

Inactivated Polio Vaccine (IPV)

- **Definition:** IPV is a vaccine made from wild-type poliovirus strains of all three serotypes (type 1, type 2, and type 3) that have been inactivated (killed) with formalin.

Advantages of IPV over OPV

- **Safety:** IPV does not carry the risk of Vaccine-Associated Paralytic Polio (VAPP), a rare but serious adverse event associated with OPV.
- **Stability:** Less sensitive to temperature fluctuations, making storage and transport easier.
- **Efficacy:** Highly effective in inducing immunity against all three types of poliovirus.
- **Suitable for All:** Can be administered to immunocompromised individuals and their close contacts, where OPV is contraindicated.

Disadvantages of IPV over OPV



- **Cost:** IPV is significantly more expensive than OPV.
- **Administration:** Requires trained healthcare personnel for intramuscular injection.
- **Herd Immunity:** Does not contribute to herd immunity as effectively as OPV.
- **Multiple Doses:** Requires multiple doses for complete immunization.

IPV Schedule as Recommended by Indian Academy of Pediatrics (IAP)

- **Primary Series:** Three doses of IPV at 6, 10, and 14 weeks of age.

Booster Dose: A single booster dose at 15–18 months of age.

---X-----X---

Q: Vaccine-Associated Paralytic Poliomyelitis (VAPP)

Definition and Etiology

- Vaccine-associated paralytic poliomyelitis (VAPP) is a rare adverse event following exposure to the Oral Poliovirus Vaccine (OPV).
- OPV contains live attenuated (weakened) polioviruses that can sporadically cause paralytic polio.
- Inactivated Poliovirus Vaccine (IPV), used exclusively in the United States since 2000, carries no risk of VAPP.

Clinical Presentation

- Clinically indistinguishable from paralysis caused by wild poliovirus or Vaccine-Derived Poliovirus (VDPV).
- Cases have been reported in both vaccinated individuals and their unvaccinated contacts.

Epidemiology

- VAPP epidemiology varies by country income level.
- In low-income countries, most cases occur in individuals who have received more than three doses of OPV.
- In middle and high-income countries, most cases occur after the first OPV dose or in unvaccinated contacts.
- Risk estimates indicate 4.7 VAPP cases per million births globally.



Management and Prevention

- Replacement of OPV with IPV in many high-income countries has reduced the VAPP burden.
- The universal introduction of IPV is expected to decrease the global VAPP burden by 80%-90%.

Vaccine-Associated Paralytic Poliomyelitis (VAPP) in India: Current Practices

Epidemiological Context

- India was declared polio-free in 2014, largely due to mass immunization campaigns using Oral Polio Vaccine (OPV).
- However, VAPP remains a concern, with sporadic cases reported annually.

Governmental Stance

- The Indian government acknowledges the risk of VAPP but considers it a necessary trade-off for the eradication of wild poliovirus.
- The Indian Academy of Pediatrics (IAP) recommends the use of at least one dose of Inactivated Polio Vaccine (IPV) in the immunization schedule to mitigate the risk of VAPP.

Current Practices

- Introduction of IPV alongside OPV in the Universal Immunization Programme (UIP).
- "Endgame Strategy" aims to eventually replace OPV with IPV entirely, in alignment with the World Health Organization (WHO) guidelines.
- Active surveillance systems are in place to monitor and report any cases of acute flaccid paralysis, including VAPP.

Risk Mitigation

- "Pulse Polio" campaigns now include a focus on IPV administration, especially in high-risk areas.
- Public awareness campaigns educate communities about the rare but potential risk of VAPP.

Challenges

- IPV is more expensive and less easily administered than OPV, posing logistical challenges.

- Maintaining high levels of vaccination coverage is essential to prevent the re-emergence of wild poliovirus and to minimize the risk of VAPP.

Future Directions

- The planned cessation of OPV poses challenges for polio eradication efforts.
- Ongoing research aims to develop safer and more effective vaccines to replace OPV.
- Research is ongoing to develop novel OPV strains with lower risks of VAPP and Vaccine-Derived Poliovirus (VDPV).

The government is considering the phased removal of type 2 OPV from the schedule, as type 2 wild poliovirus has been eradicated globally.

---X-----X---

Q: HPV Vaccine; current status

Introduction

- Human Papillomavirus (HPV) is a group of related viruses, some of which are linked to various cancers including cervical, oropharyngeal, and anal cancers.
- The HPV vaccine aims to provide immunity against specific high-risk strains of HPV responsible for the majority of these cancers.

Types of HPV Vaccines

- **Gardasil 9:** Protects against HPV types 6, 11, 16, 18, 31, 33, 45, 52, and 58.
- **Cervarix:** Protects against HPV types 16 and 18.

Mechanism of Action

- The vaccine is composed of virus-like particles (VLPs) that mimic the HPV virus, stimulating the immune system to produce antibodies without causing infection.

Efficacy

- Clinical trials and real-world studies have shown a significant reduction in HPV-related cancers and genital warts.
- Provides nearly 100% protection against cervical precancers and genital warts caused by the types covered.

Recommended Population

- Both males and females, typically starting at ages 11-12.
- Catch-up vaccines are recommended for males through age 21 and females through age 26.

Administration Schedule

- Two-dose schedule for individuals under 15.
- Three-dose schedule for those aged 15-26 and immunocompromised individuals.

Adverse Effects

- Generally well-tolerated.
- Common side effects: Pain at injection site, fever, dizziness, and nausea.
- Serious side effects are rare.

Controversies and Ethical Considerations

- **Sexual Behavior:** Concerns that vaccination may promote sexual activity among adolescents, although evidence does not support this.
- **Mandatory Vaccination:** Ethical debates on making HPV vaccination compulsory.
- **Cost and Accessibility:** High cost can be a barrier, especially in low-income settings.

Public Health Impact

- Significant reduction in HPV-related cancers and diseases.

Herd immunity benefits even the unvaccinated population.

-----X-----X-----

Q: Utility and Controversy of HPV Vaccine

Utility

- **Cancer Prevention:** Effective in preventing infection by certain strains of Human Papillomavirus (HPV), which are responsible for the majority of cervical, anal, and oropharyngeal cancers.
- **Genital Warts:** Provides protection against strains of HPV that cause genital warts.

- **Herd Immunity:** Widespread vaccination can confer herd immunity, protecting even those who are not vaccinated.
- **Cost-Effectiveness:** Long-term cost savings by reducing the need for cancer treatments and surgeries related to HPV.
- **Gender Neutral:** Recommended for both males and females, broadening the scope of protection.

Controversy

- **Safety Concerns:** Public skepticism exists regarding the vaccine's long-term safety, although extensive studies have shown it to be safe.
- **Sexual Activity:** Some argue that HPV vaccination may encourage sexual promiscuity among adolescents, although research does not support this claim.
- **Mandatory Vaccination:** Ethical debates arise over whether the vaccine should be mandatory.
- **Access and Cost:** High cost of the vaccine can be a barrier in low-income communities and developing countries.
- **Incomplete Protection:** Does not protect against all strains of HPV, leading some to question its effectiveness.

Age of Administration: Ethical concerns about the recommended age for vaccination, which is often before sexual debut.

---X-----X---

Q: Rotavirus Vaccine

- Rotavirus is the leading cause of severe diarrhea in infants and young children worldwide.
- Rotavirus vaccines aim to prevent rotavirus gastroenteritis, thereby reducing hospitalizations and mortality.

Types of Rotavirus Vaccines

- **Rotarix:** A monovalent vaccine containing a single attenuated human rotavirus strain.
- **RotaTe**-----X-----X---
- **Q:** A pentavalent vaccine containing five reassortant rotaviruses.

- **Rotavac:** An indigenously developed monovalent vaccine from India.

Mechanism of Action

- Live attenuated vaccines that mimic natural infection, stimulating both humoral and cellular immunity without causing disease.

Efficacy

- Clinical trials have shown 85-98% efficacy in preventing severe rotavirus gastroenteritis.
- Real-world effectiveness studies corroborate these findings.

Recommended Population

- Infants, with the first dose usually administered at 6 weeks of age.

Administration Schedule

- Rotarix: Two-dose schedule at 2 and 4 months.
- RotaTe----X-----
-----X---
- Q: Three-dose schedule at 2, 4, and 6 months.
- Rotavac: Three-dose schedule at 6, 10, and 14 weeks.

Adverse Effects

- Generally well-tolerated.
- Common side effects: Mild diarrhea, vomiting, and irritability.
- Rare but serious: Intussusception, a type of bowel obstruction.

Public Health Impact

- Significant reduction in rotavirus-related hospitalizations.
- Cost-effective when considering the healthcare costs saved.

Ethical and Policy Considerations

- **Equity in Access:** Ensuring vaccine availability in low-income settings.

Public Awareness: Overcoming vaccine hesitancy through education.

---X-----X---

**Q: BCG Vaccine**

- Bacillus Calmette-Guérin (BCG) vaccine is primarily used against tuberculosis (TB).
- Developed by Albert Calmette and Camille Guérin in the 1920s.
- Also offers some protection against other mycobacterial infections like leprosy and Buruli ulcer.

Types

- **Tokyo 172 Strain:** Used in Japan and many other countries.
- **Danish 1331 Strain:** Used in Europe and various international programs.
- **BCG-Russia (Moscow) Strain:** Common in Russia and former Soviet states.

Mechanism of Action

- Live attenuated vaccine derived from Mycobacterium bovis.
- Stimulates cell-mediated immunity, providing a Th1-type immune response.

Efficacy

- Varies widely, from 0% to 80%, depending on the population and the type of TB.
- Most effective against severe forms of TB in children, such as TB meningitis.

Recommended Population

- Infants and children in countries with high TB prevalence.
- Healthcare workers in settings with drug-resistant TB cases.

Administration Schedule

- Single intradermal injection, usually given at birth or during infancy.
- Revaccination is generally not recommended.

Adverse Effects

- Local abscess formation at the injection site.
- Regional lymphadenitis.
- Rare: Disseminated BCG infection, osteitis.

Public Health Impact

- Significant reduction in childhood morbidity and mortality from TB.

- Part of the World Health Organization's Expanded Program on Immunization (EPI).

Ethical and Policy Considerations

- **Global Access:** Ensuring vaccine availability in high-burden countries.
- **Risk Assessment:** Balancing the risks and benefits in low-burden countries.

Current Research and Innovations

BCG vaccine as a potential immunomodulator for various other diseases, including COVID-19.

---X-----X---

Q: BCG Lymphadenitis

- ✚ BCG lymphadenitis is a relatively common and usually benign complication of BCG vaccination.
 - ✚ Management primarily involves observation and, in cases of suppuration, needle aspiration to prevent complications.
 - ✚ Surgical intervention is reserved for refractory cases. It's important to differentiate BCG lymphadenitis from TB lymphadenitis, as the management strategies differ significantly.
- **Appearance:** Isolated axillary (or supraclavicular/cervical) lymph node enlargement with a history of BCG vaccination on the same side.
 - **Symptoms:** No tenderness or raised temperature over swelling (except in impending rupture state), without fever or other constitutional symptoms.
 - **Diagnosis:** Tuberculin skin test (TST) is not helpful in distinguishing BCG lymphadenitis from TB lymphadenitis. Fine-needle aspiration cytology (FNAC) and the presence of acid-fast bacilli (AFB) or results from Cartridge Based Nucleic Acid Amplification Test (CBNAAT) cannot distinguish between BCG or TB adenitis as the results are similar.

Types of BCG Lymphadenitis

1. **Simple or Non-Suppurative:** No pus formation.
2. **Suppurative:** Characterized by the development of fluctuation in swelling, with erythema and edema of the overlying skin.

3. **Disseminated BCGiosis:** Seen in immunosuppressed HIV-infected/SCID children.

Course of Untreated Lymphadenitis

- **Non-Suppurative:** Regresses spontaneously over a few weeks to months; can take up to 6-8 months. In some cases, progressive enlargement and evolution into abscess formation can occur.
- **Suppurative:** Can regress spontaneously, but the most likely outcome is the development of spontaneous rupture and sinus formation. Healing usually takes several months.

Management of Lymphadenitis

- **Non-Suppurative:** Allowed to regress spontaneously.
- **Suppurative:** If already suppuration has occurred or develops, needle aspiration may be done to prevent rupture and subsequent large ulceration. Repeated aspiration may be required.
- **Surgical Excision:** Considered if needle aspiration fails, as in cases with multiloculated or matted glands.

Medication: Erythromycin and antituberculous therapy (ATT) are ineffective in hastening regression or preventing suppuration in BCG lymphadenitis and should not be used.

---X-----X---

Q: COVID-19 Vaccines

- Developed to combat the SARS-CoV-2 virus, responsible for the COVID-19 pandemic.
- Multiple platforms used: mRNA, viral vector, protein subunit, and inactivated virus.

Types of COVID-19 Vaccines

- **mRNA Vaccines:** Pfizer-BioNTech, Moderna
- **Viral Vector Vaccines:** AstraZeneca, Johnson & Johnson, Sputnik V
- **Protein Subunit Vaccines:** Novavax
- **Inactivated Virus Vaccines:** Sinopharm, Sinovac-CoronaVac

Mechanism of Action



- **mRNA:** Introduce spike protein mRNA to stimulate immune response.
- **Viral Vector:** Use another virus as a vector to deliver spike protein gene.
- **Protein Subunit:** Use harmless pieces of SARS-CoV-2 to trigger an immune response.
- **Inactivated Virus:** Use a virus that has been killed or inactivated.

Efficacy

- **Pfizer-BioNTech:** ~95% efficacy against symptomatic COVID-19.
- **Moderna:** ~94% efficacy.
- **AstraZeneca:** ~70% efficacy.
- **Johnson & Johnson:** ~66% efficacy.

Recommended Population

- Generally, adults 18 years and older.
- Pfizer-BioNTech approved for adolescents 12-17 in some jurisdictions.

Administration Schedule

- **Pfizer-BioNTech:** Two doses, 21 days apart.
- **Moderna:** Two doses, 28 days apart.
- **AstraZeneca:** Two doses, 4 to 12 weeks apart.
- **Johnson & Johnson:** Single dose.

Adverse Effects

- Common: Pain at injection site, fatigue, headache.
- Rare: Anaphylaxis, myocarditis, blood clotting disorders (AstraZeneca).

Public Health Impact

- Significant reduction in COVID-19 cases, hospitalizations, and deaths.
- Contribution to herd immunity.

Ethical and Policy Considerations

- **Vaccine Equity:** Fair distribution between and within countries.
- **Vaccine Passports:** Ethical implications of requiring proof of vaccination for travel or other activities.

Current Research and Innovations

- Booster doses for waning immunity.

Vaccines targeting multiple variants.

---X-----X---

Q: Japanese Encephalitis (JE) Vaccines

Types of JE Vaccines

1. *Inactivated Mouse Brain-Derived Vaccines:*

- Example: JE-VAX (no longer produced).
- Derived from virus grown in mouse brains, inactivated by formalin.

2. *Inactivated Vero Cell-Derived Vaccines:*

- Example: IXIARO/JESPECT.
- Produced by growing the virus in Vero cells, followed by inactivation.

3. *Live Attenuated Vaccines:*

- Example: SA 14-14-2 vaccine.
- Developed from a weakened strain of the JE virus.

4. *Recombinant Live Attenuated Vaccines:*

- Example: ChimeriVax-JE.
- Uses genetic engineering to combine JE virus antigens with another virus.

Efficacy and Effectiveness

- **High Efficacy:** Most JE vaccines have shown high efficacy in preventing JE in clinical trials.
- **Duration of Protection:** Generally provides long-term protection, but booster doses may be recommended.

Dosage and Administration

- **Dosage:** Varies depending on the vaccine. Some require a single dose, while others require multiple doses.

- **Booster Doses:** May be recommended for prolonged protection, especially for travelers or those in endemic areas.

Indications

- **Travelers:** Recommended for travelers to JE-endemic areas who will spend extensive time outdoors.
- **Residents:** Recommended for people living in endemic areas, especially in rural regions with high mosquito exposure.

Contraindications and Precautions

- **Allergies:** Contraindicated in individuals with severe allergic reactions to vaccine components.
- **Pregnancy and Breastfeeding:** Safety data may be limited; consult healthcare providers for recommendations.

Side Effects

- **Common Side Effects:** Pain at the injection site, mild fever, headache.
- **Severe Reactions:** Rare, but can include allergic reactions or neurological symptoms.

Storage and Handling

- **Cold Chain:** Most JE vaccines require refrigeration for storage.
- **Handling:** Should be administered by trained healthcare professionals.

Global Recommendations

- **WHO Recommendations:** The World Health Organization recommends JE vaccination in all regions where the disease is a recognized public health problem.

Public Health Impact

- **Reduction in Cases:** Widespread vaccination has significantly reduced JE cases in several countries.

Integration into National Immunization Programs: Many endemic countries have integrated JE vaccines into their routine immunization schedules for children.

---X-----X---

Q: Vaccination in a child with cancer chemotherapy

- ❖ Vaccination in a child undergoing cancer chemotherapy requires careful consideration due to the altered immune response associated with both the underlying malignancy and the immunosuppressive effects of chemotherapy
- ❖ Vaccination in a child undergoing cancer chemotherapy must be individualized, considering the type and intensity of chemotherapy, the child's immune status, and the risk of vaccine-preventable diseases
- ❖ Collaboration between pediatricians, oncologists, and infectious disease specialists is essential for developing an optimal vaccination strategy
- ❖ The goal is to provide the best possible protection against infections while minimizing the risk of vaccine-related complications in this vulnerable population.

General Principles:

1. *Timing of Vaccination:*

- Ideally, vaccines should be administered before starting chemotherapy.
- Live vaccines are contraindicated during intense immunosuppression.

2. *Live Vaccines:*

- Avoid live vaccines (e.g., MMR, Varicella) during chemotherapy and for a specified period after completion (usually 3-6 months).
- Risk of vaccine-derived disease due to weakened immune system.

3. *Inactivated Vaccines:*

- Generally safer during chemotherapy.
- Response to vaccine may be suboptimal; revaccination may be needed after chemotherapy completion.

4. *Annual Influenza Vaccine:*

- Strongly recommended, as influenza can be severe in immunocompromised children.

5. *Pneumococcal and Meningococcal Vaccines:*

- Recommended due to increased risk of invasive pneumococcal and meningococcal diseases.

Specific Recommendations:



1. **Before Chemotherapy:**

- Update all routine vaccinations.
- Administer live vaccines if possible and if time permits.

2. **During Chemotherapy:**

- Avoid live vaccines.
- Inactivated vaccines can be given but may have reduced efficacy.
- Influenza vaccine (inactivated) should be given annually.

3. **After Chemotherapy:**

- Wait for immune reconstitution (usually 3-6 months) before giving live vaccines.
- Consider revaccination with inactivated vaccines, especially if administered during periods of intense immunosuppression.

4. **Hematopoietic Stem Cell Transplant (HSCT) Patients:**

- Special vaccination schedule post-transplant.
- Both live and inactivated vaccines according to the post-transplant immunization guidelines.

Monitoring and Precautions:

1. **Immune Status Monitoring:**

- Regular assessment of immune function to determine vaccine timing.
- CD4 count and immunoglobulin levels can guide decisions.

2. **Collaboration with Oncologists:**

- Coordinate with the child's oncology team for optimal timing and selection of vaccines.

3. **Family and Household Members:**

- Ensure up-to-date vaccination to protect the immunocompromised child.
- Live vaccines in household members are generally safe but require precautions in certain scenarios.

4. **Infection Prevention:**

- Emphasize other protective measures against infections, such as hand hygiene and avoiding exposure to infectious diseases.

---X-----X---

Q: AEFI types

Type of AEFI	Description	Examples
Vaccine Product-Related Reaction	These reactions are directly attributable to the vaccine itself due to its inherent properties. They are often predictable and can be related to the active component of the vaccine or any of its other constituents.	Anaphylactic reactions to a component of the vaccine. Local reactions like swelling or redness at the injection site. Fever, malaise, or muscle pain.
Vaccine Quality Defect-Related Reaction	Occur due to issues with the vaccine's quality, such as manufacturing defects, degradation due to improper storage, or issues during transportation. These are preventable with proper quality control measures.	Reactions due to a contaminated vaccine batch. Adverse effects from a vaccine that was improperly stored leading to degradation of its components.
Immunization Error-Related Reaction	These are the result of errors in the immunization process, including mistakes in vaccine preparation, handling, or administration. They are preventable through proper training and adherence to protocols.	Administration of the vaccine via the wrong route (e.g., intramuscular vaccine given subcutaneously). Use of an expired vaccine. Infections due to use of a non-sterile injection technique.
Immunization Anxiety-Related Reaction	Stem from the psychological response to the act of vaccination rather than the vaccine itself. These reactions are more common in individuals with a history of needle phobia or anxiety about medical procedures.	Fainting or syncope during or immediately after vaccination. Hyperventilation or panic attacks. Psychogenic reactions such as nausea or dizziness.
Coincidental Events	These events are not caused by the vaccine but happen to occur following immunization. They are unrelated incidents that would have occurred regardless of vaccination and are often mistaken as vaccine-related due to their timing.	Sudden Infant Death Syndrome (SIDS) occurring after vaccination but with no causal link to the vaccine. Diagnosis of a chronic condition like diabetes or asthma shortly after vaccination.
Programmatic Errors	Related to errors in the implementation of the vaccination program rather than the vaccine itself. These include logistical	Vaccinating an age group not indicated for the vaccine. Misinterpretation of vaccine contraindications leading to

	errors, misinterpretation of guidelines, or administrative mistakes.	vaccination of an ineligible individual. Errors in vaccine scheduling or dosage.
Cluster of Events	Refers to multiple similar AEFI cases occurring in a specific time frame or geographical location. These clusters often trigger investigations to determine if they are coincidental or have a specific cause.	A series of severe allergic reactions in a particular clinic or region. Multiple cases of a rare adverse event following the introduction of a new vaccine in a specific area.
Unknown	These are adverse events for which there is insufficient information to categorize them into any of the above categories, or their cause cannot be determined with the available data.	Adverse events reported without enough detail to ascertain their nature. Reactions with symptoms that do not fit into known categories of vaccine reactions or are of unclear etiology.

- Vaccine Product-Related Reactions are adverse events directly attributable to the vaccine itself due to its inherent properties.
- These reactions can be related to the active component of the vaccine, adjuvants, preservatives, stabilizers, or any other constituents.

1. **Nature of Reactions:**

- **Predictable:** Often related to the pharmacological action of the vaccine.
- **Immunological Basis:** Can be due to the immune response elicited by the vaccine.
- **Constituent Sensitivity:** Reactions to various components of the vaccine, not just the antigen.

2. **Types of Reactions:**

- **Immediate Hypersensitivity Reactions:** These are allergic reactions that can range from mild (urticaria, itching) to severe (anaphylaxis). They are usually IgE-mediated and occur within minutes to hours of vaccination.
- **Local Reactions:** Common and include pain, swelling, and redness at the injection site. These are usually mild and self-limiting.

- **Systemic Reactions:** Such as fever, malaise, headache, or muscle pain. These are generally mild and resolve without treatment.

3. **Mechanisms:**

- **Immune Response to Antigen:** The body's response to the vaccine antigen can sometimes manifest as a mild fever or local site reaction.
- **Adjuvants:** Substances like aluminum salts are used to enhance the immune response and can cause local reactions.
- **Preservatives and Stabilizers:** Chemicals like thimerosal or gelatin, used to maintain vaccine stability and longevity, can occasionally cause hypersensitivity reactions.

4. **Risk Factors:**

- **Allergic History:** Individuals with a history of allergies, especially to vaccine components, are at a higher risk.
- **Genetic Factors:** Certain genetic predispositions can influence the likelihood of reactions.

5. **Diagnosis:**

- **Clinical Assessment:** Based on the timing, nature, and severity of symptoms following vaccination.
- **Allergy Testing:** May be required for suspected hypersensitivity to specific vaccine components.

6. **Management:**

- **Mild Reactions:** Usually require no treatment or can be managed with analgesics or antihistamines.
- **Severe Reactions (e.g., Anaphylaxis):** Require immediate medical attention, including administration of epinephrine and supportive care.

7. **Prevention and Precautions:**

- **Screening for Allergies:** Prior to vaccination, especially for known allergens in vaccines.
- **Vaccine Selection:** Using alternative vaccines if an individual has a known allergy to a component of a particular vaccine.
- **Observation Post-Vaccination:** Monitoring individuals for a short period post-vaccination to manage any immediate reactions.

8. **Reporting and Surveillance:**

- **AEFI Reporting Systems:** Healthcare providers are encouraged to report all suspected vaccine product-related reactions for ongoing safety surveillance.
- **Vaccine Safety Monitoring:** Regulatory bodies continuously monitor vaccine safety, and these reports contribute to assessing the risk-benefit profile of vaccines.

9. **Public Health Implications:**

- **Confidence in Vaccination Programs:** Managing and communicating about these reactions effectively is crucial for maintaining public trust in vaccines.
- **Risk-Benefit Analysis:** While these reactions can occur, the benefits of vaccination in preventing disease far outweigh the risks of adverse reactions for the vast majority of the population.

---X-----X---

Q: Vaccine hesitancy

- ❖ Vaccine hesitancy refers to the delay in acceptance or refusal of vaccines despite the availability of vaccination services
- ❖ It is a complex and context-specific phenomenon, varying across time, place, and vaccines
- ❖ Understanding and addressing vaccine hesitancy is crucial for maintaining high vaccination coverage and ensuring public health
- ❖ Vaccine hesitancy is a significant barrier to achieving widespread vaccine coverage and requires a multifaceted approach to address
- ❖ It involves understanding the root causes of hesitancy, engaging with communities, providing accurate information, and building trust in vaccines and the healthcare system
- ❖ The role of healthcare providers, public health authorities, and community leaders is crucial in this effort.

1. **Causes of Vaccine Hesitancy:**

- **Misinformation and Lack of Knowledge:** Spread of false information about vaccines, leading to misconceptions.
- **Cultural, Religious, and Philosophical Beliefs:** Beliefs that discourage vaccination.

- **Safety Concerns:** Fears about potential side effects or adverse events.
- **Distrust in Healthcare System or Government:** Skepticism about vaccine efficacy or motives behind vaccination campaigns.
- **Complacency:** Perception that the risk of vaccine-preventable diseases is low.

2. **Impact of Vaccine Hesitancy:**

- **Outbreaks of Vaccine-Preventable Diseases:** Reduced herd immunity, leading to outbreaks.
- **Increased Healthcare Costs:** Treating preventable diseases is often more expensive than vaccination.
- **Public Health Risks:** Endangers vulnerable populations, including those who cannot be vaccinated.

3. **Strategies to Address Vaccine Hesitancy:**

- **Education and Awareness Campaigns:** Providing accurate, evidence-based information about vaccines.
- **Engaging with Communities:** Understanding specific concerns and cultural contexts.
- **Building Trust:** Transparent communication from healthcare providers and authorities.
- **Involvement of Influencers:** Utilizing community leaders or celebrities to promote vaccination.
- **Policy Interventions:** Implementing policies that encourage vaccination, such as school entry requirements.

4. **Role of Healthcare Providers:**

- **Effective Communication:** Addressing concerns and questions about vaccines.
- **Recommendation:** A strong recommendation from a healthcare provider is a key influencer in the decision to vaccinate.
- **Patient-Centered Approach:** Understanding individual patient's concerns and providing tailored information.

5. **Monitoring and Research:**

- **Surveillance of Vaccine Attitudes:** Tracking public sentiment towards vaccines.
- **Research on Vaccine Safety and Efficacy:** Ongoing research to ensure and communicate vaccine safety.

6. **Global and Local Initiatives:**

- **World Health Organization (WHO) Initiatives:** Global strategies to enhance vaccine confidence.
- **Local Health Campaigns:** Targeted efforts based on the specific needs of communities.

---X-----X---

Q: MR vaccine

- ✚ The MR vaccine is a key component of public health strategies to control and eventually eradicate measles and rubella.
- ✚ Its widespread use has significantly reduced the incidence of these diseases and their associated complications.
- ✚ The MR vaccine is a combination vaccine that protects against two significant viral diseases: Measles and Rubella.

Composition

- **Measles Component:** Live attenuated measles virus, derived from the Edmonston-Zagreb strain.
- **Rubella Component:** Live attenuated rubella virus, derived from the RA 27/3 strain.

Indications

- **Primary Vaccination:** Typically administered to children. The first dose is usually given at 12-15 months of age.
- **Booster Dose:** A second dose is often given at 4-6 years of age, though the schedule can vary depending on the national immunization program.
- **Catch-up Vaccination:** For individuals who missed the vaccine at the recommended age. As a part of MR campaign.

Administration

- **Route:** Subcutaneous injection.
- **Dosage:** Standard dose as per the manufacturer's guidelines.

- **Site:** Commonly administered in the upper arm.

Efficacy and Immunity

- **Measles:** Highly effective in preventing measles, a highly contagious viral disease that can lead to serious health complications.
- **Rubella:** Effective in preventing rubella, which is particularly important for preventing congenital rubella syndrome (CRS) in pregnant women, which can cause serious birth defects.

Safety and Side Effects

- **Common Side Effects:** Fever, mild rash, and swelling or redness at the injection site.
- **Rare Complications:** More serious side effects are rare but can include allergic reactions.

Contraindications

- **Severe Allergic Reactions:** To any component of the vaccine.
- **Immunocompromised Individuals:** Those with weakened immune systems may need to avoid live vaccines.
- **Pregnancy:** Not recommended for pregnant women due to the live virus component.

Public Health Importance

- **Eradication of Measles and Rubella:** The vaccine is crucial in the global efforts to eradicate measles and control rubella, particularly to prevent CRS.
- **Outbreak Control:** Helps in controlling outbreaks of measles and rubella.

MR Campaign

- The MR vaccination campaign in India is a key public health initiative with far-reaching implications for child health and disease eradication.

- Its success hinges on effective implementation, public cooperation, robust surveillance, and sustained efforts to integrate the MR vaccine into routine immunization programs.
- This campaign is a critical step towards achieving the goal of a measles and rubella-free India and contributes significantly to global eradication efforts.
- **Reduction in Disease Burden:** Significant reduction in measles and rubella cases post-campaign.
- **Global Commitment:** Contribution to the global goal of measles and rubella elimination.

Objectives of the MR Campaign

- **Eradication of Measles and Rubella:** To drastically reduce and ultimately eliminate measles and rubella/CRS in India.
- **Immunization Coverage:** To vaccinate a broad segment of the population, particularly children, against these diseases.

Target Population

- **Children Aged 9 Months to 15 Years:** The campaign primarily targets all children in this age group, regardless of their previous vaccination status.
- **Nationwide Reach:** The campaign aims to cover all states and union territories of India.

Implementation Strategy

- **Phased Approach:** The campaign is implemented in phases, targeting different states and regions at different times.
- **School-Based and Community-Based Campaigns:** Vaccinations are administered through schools and community health centers.
- **Integration with Routine Immunization:** Post-campaign, the MR vaccine is intended to replace the measles vaccine in the routine immunization schedule.

MR Vs MMR

- ❖ The decision by the Government of India to focus on the Measles and Rubella (MR) vaccine, rather than the Measles, Mumps, and Rubella (MMR) vaccine,

was strategic and based on several considerations specific to India's public health priorities and epidemiology

- ❖ The choice of MR vaccine over MMR by the Government of India reflects a strategic decision based on disease prevalence, public health priorities, resource allocation, and alignment with global health goals
- ❖ While mumps remains a relevant health concern, the immediate focus on measles and rubella addresses the more pressing public health challenges
- ❖ This approach allows for effective utilization of resources, ensuring maximum impact in reducing the burden of these diseases
- ❖ As India progresses in its public health endeavors, the vaccination strategy may evolve in response to changing epidemiological patterns and healthcare objectives.

-----X-----X-----